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Original Articles.

THE BRITISH ANTARCTIC EXPEDITION, 1910-1913.

By Staff Surgeon E. L. ATKINSON, R.N.

SNOW BLINDNESS.

The following observations refer to periods from November to January in each year during which time the sun is at its maximum altitude and the light at its brightest. Where a party is on land with black rock the relief is marked, and therefore most of the observations refer to the dead white plain of the Barrier. For the physical part of these I am indebted to Mr. C. S. Wright, B.A., who was the physicist to the Expedition.

The strength of the illumination was taken by means of Watkins's exposure meter. A rapid light facing the sun ranged from one and a quarter to four seconds; the strongest light recorded has been 1 by the same meter in California. On dull overcast days the light varied from 1 to 20; the illumination in a studio is from 10 to 20. On bright days the altitude of the sun has a great deal to do with the intensity of the light on account of the absorption by the atmosphere. Therefore the liability to snow blindness on bright days is more pronounced towards noon. Up to the present, and until further observations can be made in England, there is nothing definite known as to the quality of the rays causing snow-blindness.

Snow blindness may roughly be divided into three kinds according to the light.

A

(*a*) On bright [illegible] strong illumination.
(*b*) Overcast [illegible] but no contrast. On [illegible] lies the [illegible] but diffused.
[illegible] Dull overcast [illegible]. Contrast is [illegible] wanting.

(*a*) *Bright Days.*—[illegible] glasses even for a [illegible] half [illegible] attack [illegible]. The eye felt perfectly well [illegible] always [illegible] was going. It [illegible]. There was a [illegible]. Photophobia [illegible] varying period [illegible] with treat[illegible] and the condi[illegible] conjunctivitis, and [illegible] the strength of the [illegible].

[illegible] was [illegible] composed of zinc [illegible] and [illegible] A [illegible] number of [illegible] supplied. These [illegible] into [illegible]. Unluckily [illegible] and the zinc sulphate lamellae generally [illegible]. On sledging [illegible] used to be [illegible] and [illegible] a rough poul[illegible] the affected [illegible] the snow-goggles. [illegible] always [illegible] comfort and was [illegible].

(*b*) *Overcast Days with [illegible] Light.*—The effect [illegible] the want of contrast [illegible] being marked [illegible] of light was [illegible] and reflection of light from the surfaces of [illegible] which were con[illegible] falling. The light [illegible] all directions [illegible] and it was impossible [illegible] between [illegible] and horizon [illegible] being prac[illegible] by the [illegible] on the feet. Contrast was entirely absent because of want of shadow, and as an instance, it was possible to be standing within arm's length of a snow cairn 9 ft. high, and yet the cairn was invisible. Eye strain was continuous, the eye striving to make out whether the foot was being placed on an even surface, and it was impossible to appreciate inequalities such as sastrugi. At the same time the illumination was intense

[illegible] and lasted [illegible] accommodate for [illegible]

[illegible] *Days*.—Although [illegible]

[illegible]

A [illegible] men was [illegible] 8.30 p.m. on the [illegible] This he did with[illegible] with low drift [illegible] logically 9.10. [illegible] December with [illegible] his eyes [illegible] ness. He worked [illegible] snow with [illegible] the 17th December he [illegible] with an [illegible] snow blindness, with [illegible] and conjunctiv[illegible] not marked.

[illegible] of Snow [illegible].—The form of leather snow goggles [illegible] by the Expedition [illegible] to the previous experience of [illegible] A. Wilson [illegible] deficiency was that the glass was [illegible] condensation was therefore a frequent [illegible] form of glass would be one [illegible] at a greater distance from the eye, which would allow more ventilation. It would also be necessary to obviate any strong light [illegible] the sides. The main object in the design of [illegible] glasses was to prevent any metal coming in contact with the [illegible]. In every other way they were suitable and comfortable. The colours of the glasses were—light to deep amber, light to deep green, [illegible] and purple. There is no doubt that the most [illegible] from every point of view were the amber glasses and their [illegible] upon the spectrum would lead one to support this conclusion. [illegible] glasses, strictly speaking, ought to be the most suitable [illegible] for the mental effect. I tried these glasses on the Barrier [illegible] Relief Expedition of October and November 1912. The [illegible] of contrast they gave through being practically a mono[illegible] light was splendid and I cannot say that they had any [illegible] effect upon the temperament. The most suitable glasses for [illegible] are those which cut out largely the blue and violet ends [illegible] spectrum, and one noticed continuously on these dull days [illegible] men who had these were in comparative comfort. As an [illegible] of this, an officer, who, being myopic, had to wear tinted [illegible] continuously and actually possessed worse sight than any of [illegible] return party, yet was able to pick up cairns on the way back [illegible] rest of us were quite unable to appreciate them at all. [illegible] bright days on the Barrier it was essential that the glasses [illegible] worn at all times. It was a matter of usage to become [illegible] to this. At first, when one was inexperienced at [illegible] time the glasses were liable to be taken off. On bright [illegible] the natural effect followed and one had to suffer from an [illegible] of snow blindness. The influence of the altitude of sun was well exemplified on the southern journey. Marching south over [illegible] had been carried on during the night time and for a [illegible] part of this period we were able to work without our glasses. [illegible] foot of the Beardmore the routine was changed to day [illegible]. Thinking that the conditions were the same, we did [illegible] glasses. The result was a sudden and plentiful attack [illegible] blindness, which came at the most awkward part of the [illegible] march.

The first attack of snow blindness always rendered one more

[illegible] [illegible] attacks. Men [illegible] were [illegible] than those with deeper [illegible]. The [illegible] [illegible] also was found to [illegible] [illegible] being less liable to the [illegible] than those [illegible].

Frostbite

[illegible] its effects may be compared with the [illegible]. The [illegible] from the loss [illegible] to the lower part of limbs.

Frostbite of First Degree.—While [illegible] common and [illegible] experience [illegible] of which [illegible] the nose [illegible] opinion [illegible] unconscious that anything was wrong. When [illegible] warned [illegible] removed the [illegible] hand [illegible] put [illegible] it upon the offending part. At the same time [illegible] would be [illegible] torn away from [illegible] with a slight tingling sensation the circulation returned [illegible] and in the course of a day [illegible] there was a very small [illegible] peripheral skin. Parts which had been subjected [illegible] such [illegible] attacks and also [illegible] warning [illegible] wind [illegible] up [illegible] realizing [illegible] that the nose [illegible] measures to bring it back.

Frostbite of Second Degree caused blisters varying [illegible] being [illegible]. It was quite common after [illegible] the fingers to be [illegible] at the end. This [illegible] blisters of varying [illegible] caused by exposure [illegible] cold [illegible] by handling cold metal objects like the [illegible]. These blisters were of no importance. When the [illegible] [illegible] with the result that after some time [illegible] and the finger became normal again. [illegible] bathing in boracic lotion and dressing with [illegible] was found to be the best method of treatment. [illegible] handling of cold metal objects the [illegible] went to the stage of blistering [illegible] [illegible] So much was this [illegible] that [illegible] was unable to approach such an object [illegible] [illegible] always [illegible] off after [illegible] [illegible] the [illegible].

Frostbite of the Third Degree [illegible] causing blisters [illegible] [illegible] The onset of gangrene [illegible] It was never immediate

[illegible] to three weeks. [illegible] contained [illegible] fluid and [illegible] dark fungat[illegible] formed after a varying period

Frost-bite of the second degree.

and then sloughing of the affected part followed. The best treatment was to empty and pare away the blisters, and to keep the parts in baths of boracic lotion, the best dressing being hazeline cream or boracic ointment.

[illegible] of gangrene [illegible] during the [illegible] superficial did not [illegible] any serious [illegible] treatment which the majority of frost [illegible] the application of a warm hand to the affected part [illegible] is probably [illegible] at the same temperature as the [illegible] Moreover the snow in the Antarctic is [illegible] angular grains and the [illegible] probably be [illegible]

[illegible] to be certain that one had no [illegible] the warm hut. The effect of [illegible] well marked. After having been [illegible] hours [illegible] frost bites would [illegible] something hot was [illegible] slow [illegible] into the [illegible] [illegible] still [illegible] strong [illegible] rise of temperature [illegible] the fact [illegible] comparatively warm day [illegible] compared [illegible] the proportion of [illegible] After [illegible] substances from the [illegible] frost bite

[illegible]

[illegible] by man [illegible] amount of woollen clothing [illegible] the Antarctic [illegible] Only certain [illegible] useful for future expedition [illegible] consisted of an under vest [illegible] supplied by the Lindsay Wolseley Company. The [illegible] rest was doubled, so that one had an extra pr[illegible] when lying in the sleeping bag on the ground. The vest was [illegible] times as thick as the ordinary winter garment [illegible] woollen sweater was worn, and in cold weather a thick [illegible] pyjama coat as well. Pants were of the same merino and about three times as thick as those for use

in temperate lands. For the legs there were continuously a pair of wind proof trousers, carrying at the [illegible] strapped to the sledge a rough smock of the same material. The head, ears, chin and neck were covered by a woollen Balaclava. As the ears are especially vulnerable the sides of the Balaclava were covered over by wind proof. For really cold sledging a nose-nip was also needed. This was sewn on the top of the Balaclava and usually made of some soft fur covered on the outside by wind proof. It was attached to two lockets on either side of the ear flaps. When not in use it was stowed under the Balaclava between that and the head. This arrangement served the purpose of freeing the nose-nip from ice and keeping it soft and fit for use.

Socks and mitts were perhaps the most important items of the kit. The best socks were grey hand knitted socks supplied by the Lindsay Welsley Company. Two pairs of them were usually worn, and in addition a thick outer pair of good hair made in Norway. The success of those made by the Lindsay Welsley Company was due to the following facts: they were strong and reliable and one might almost say never wore out. At the same time they were of loose texture and if the perspiration from the feet had frozen upon them they would dry quickly when hung out for the night. The goat hair socks would also dry quickly, but they were extremely tough and it was almost impossible sometimes to put on a sock that was as hard as a board. It was essential each night on camping to change the footgear immediately, the socks having become saturated with perspiration. A special kind of a very thick woollen sock were kept for sleeping in and these remained practically dry. Over them was worn a loose fitting bag of some fur. When the socks were changed they were pinned together with a safety pin and hung outside on a line stretched between two ski sticks. If there was a good sun by next morning they were completely dry and comfortable.

The mitts are largely a matter of experience and need more care than any other kind of garment. The following were found to be of the greatest general use for summer and winter work: a pair of half mitts of fairly thick woollen material, extending well up the arm and pinned in that position to prevent their falling down. They reached half way down the fingers, and the thumb was in a separate compartment. Over these were worn a pair of very light woollen mitts; the compartment for the fingers was single, and there was a separate one for the thumb. The mits were cut short so that they only extended to the junction of the wrist with the hand.

[illegible] after they had frozen the hand [illegible] be [illegible] slipped into them. Mitts with a prolonged wrist could not be donned when frozen. It was also possible, them [illegible] light nature to dry them quickly and to handle the cooker when wearing them. Under summer conditions these were sufficient but ordinarily one wore as well over all a pair of fur mitts. In these again the thumb was separate and the fingers were in a separate compartment. They were suspended from the neck by means of lamp wick so as to be always ready in case of need.

Over the socks Finneskoe or fur shoes were worn. These were made from the better parts of reindeer hide. It was just as essential to see that the Finneskoe were dry as the socks. As soon as camp was reached they were removed and allowed to freeze roughly into the form of the foot. They were then hung outside to dry. The life of Finneskoe depended almost entirely on the amount of care taken to brush them clear of snow before entering the tent. Minute particles of moisture would be sure to cause loss of their hair and in consequence a loss also of their properties of preserving warmth. To keep the Finneskoe well in place it was advisable to wear puttees bound round their tops and over the wind proof trousers. During cold weather with the temperature below $-30°$ F. there was always an accumulation of frost and ice between the pants and the outer wind covering. This was shaken out at the end of the march. If the puttees were worn high, for instance up to the knee, the accumulation occurred there and was extremely uncomfortable. It is better therefore to confine the puttees to the lower half of the leg. A wind helmet was also worn and was best sewn on the back of the wind proof smock. It had a rounded funnel stiffened in the outer part by wire so that it would be roughly shaped and trimmed to the wind. The remainder of the helmet consisted of wind proof with a long neck so that the valance could be tucked within the neck piece of the smock. These helmets were uncomfortable and when once worn in cold weather were difficult to take on and off. The breath and perspiration froze within them and made them extremely hard.

The Ventilation, Sanitation and Warming of the Hut

The hut was a building 50 ft. by about 25 ft. It was placed upon a level piece of ground without any pedestals. The walls consisted of several sheathings and in the intervening spaces

[illegible] uninflammable [illegible] was placed. The [illegible] was [illegible] stance known [illegible]

[illegible] was by means of the galley [illegible] which was kept [illegible] day and night. During the colder part of the winter it was found necessary to burn [illegible] at the other [illegible] from the [illegible] central part of the [illegible] connected with an upright funnel [illegible]

[illegible] was [illegible] by means of an [illegible] through the central part of the roof the [illegible] through the [illegible] was found [illegible] during this [illegible] beneath the hut an upright [illegible] through a hole in the floor [illegible] on the doors [illegible] supplemented by a [illegible] which [illegible] through the [illegible]. When [illegible] the arrangement was that [illegible]. The temperature of the hut [illegible] from [illegible] 32 [illegible] in the morning [illegible] On the hooks of the [illegible] were hung to dry.

[illegible] was [illegible] and [illegible] was [illegible] which was [illegible] matter in these [illegible] frequently and became [illegible]

HEALTH [illegible] WINTER

Measures [illegible] Scurvy

It is essential in maintaining the health of a party under these conditions that if possible at least two [illegible] hard exercise be taken every day. This was a routine that was maintained throughout the two winters and was only neglected during bad weather when it was impossible to go out. Nearly [illegible] in the first [illegible] exercise his pony and in the second [illegible] his mule. Other exercises were found by digging holes through the ice in order to catch fish, walking, skiing, and [illegible] could generally be done but were dependent on the weather. During the morning all hands were employed doing work [illegible]

generally preparing for the [illegible] sledging [illegible]. After the party had exercised their [illegible] the [illegible] were allowed to regard the [illegible] of the [illegible]. There was an abundance of work [illegible] and the health of the Expedition was invariably [illegible]. Every [illegible] record of measurements and weights was kept. At the same time [illegible] capacity and grip were taken. Also [illegible] observations were taken of [illegible] blood.

[illegible]

16th May 1911		[illegible]	[illegible]
Griffith Taylor	N [illegible]	[illegible]	N [illegible]
Cherry Garrard	N [illegible]	[illegible]	N [illegible]
Bowers	N [illegible]	[illegible]	N [illegible]
Capt Scott	N [illegible]	[illegible]	N [illegible]
Simpson	N [illegible]	Atkinson	N [illegible]
Gran	N [illegible]	[illegible]	[illegible]
Crean	N [illegible]	Meares	N [illegible]
Debenham	N [illegible]	[illegible]	N [illegible]
Ponting	N [illegible]	[illegible]	N [illegible]
Oates	N [illegible]	[illegible]	N [illegible]
Wright	N [illegible]	[illegible]	N [illegible]
Meares	N [illegible]	[illegible]	N [illegible]
Lieutenant Evans	N [illegible]	[illegible]	N [illegible]
Dr Wilson	N [illegible]	[illegible]	N 40
Evans C. I	N [illegible]	[illegible]	N/40
Keohane	N [illegible]	[illegible]	N/40
Ford	N [illegible]	[illegible]	N/40
Lashley	N [illegible]	[illegible]	N 40
Atkinson	N [illegible]	Cherry Garrard	N 40
Nelson	N [illegible]	[illegible]	N/40
Day	N [illegible]	[illegible]	N 40 –
Hooper	N [illegible]	[illegible]	N 40
Clissold	N 40	[illegible]	N 40
Anton	N [illegible]	[illegible]	N 40 –
Dimitri	N 40	[illegible]	N 40
20th [illegible] 1911		[illegible] 1911	
Cape Crozier Party		[illegible]	N/40 –
Dr Wilson	N 30	[illegible]	N [illegible]
Lieut Bowers	N [illegible]	Cherry Garrard	N 40 +
Cherry Garrard	N [illegible]		
Wrong side		[illegible]	

(All taken at N/40 none tested at N [illegible] all [illegible] Debenham Lieutenant Evans and Clissold [illegible] Debenham taken on arising from bed after [illegible])

The method used was that of Sir Almroth Wright prevention of scurvy being the primary object of the investigations. The above lists give the observations and also the effect of the

were [illegible] by Dr Wilson Lieutenant [illegible] and Cherry-Garrard. The normal limits were supposed to be between N/2[illegible] and N/[illegible]. A minus sign means that the reaction of the litmus paper was [illegible] at that dilution. A plus sign means that the reaction of the litmus paper was marked at that solution.

Immediately after landing we took the trouble to secure as much fresh food as we possibly could. This consisted of Skua gulls, Adelie penguins, and Weddel seals. The seals were skinned, and their carcases frozen for future use. The penguins and skuas were skinned and gutted and a large cave was dug in a big ice drift wherein the carcases were stowed. Besides these we had stored in the ice chamber of the "Terra Nova" nearly a hundred carcases of sheep from New Zealand. As these were infected superficially with a fungus, it was thought advisable to use them only sparingly. Seal meat formed a constituent of at least two meals a day and we were allowed mutton only on Sundays as a treat. Seal flesh is an excellent anti-scorbutic. It is extremely rich in blood, freezes firmly, and owing to the sterile atmosphere cannot deteriorate. It is slightly distasteful to many people especially if they have been obliged to perform the gutting of the seal, but when hungry we could all appreciate this food, and eat very large amounts. Penguins are good eating, but they are not economical because of the large proportion of bone.

The only case of scurvy that occurred was attributable to easily explainable causes. Lieutenant Evans was away from the Hut for two months before starting on the southern journey. During this time he lived entirely on sledging provisions. He was dependent for his food on being able to return from time to time to the Hut and from there obtain fresh supplies. As the weather was bad this was not always possible. He therefore started on the southern journey two months to the bad as compared with the rest of the party.

The fate of the Southern Party was due entirely to starvation and exposure. In their case there was no mention and no sign of scurvy at all. It is quite easy in these climes to prevent any symptoms of scurvy. This was shown in the case of Lieutenant Campbell and his party who, living under the worst conditions for contraction of the disease, came through without any ill effects.

Effect of Sledging upon the Individual

The Effect of Concentrated Food after Man-hauling for more than two Months.—All parties noticed after being out for more than

two months [illegible] they got practically [illegible] from this [illegible] became exactly like a machine. With [illegible] it was possible to go on for some time and [illegible] a certain [illegible]. With a little extra food a little more work could [illegible]. After this period one began to expend the body tissues on the ration that was provided. On the return from the southern journey emaciation in every case was extreme and the effects of cold were naturally much more severe in this state. Owing to the fatty nature of the food defæcation was extremely easy and in this way we reacted immediately to any increase of food.

The Monotony of Travelling over a Dead White Surface on overcast days, when no horizon was visible, was extremely marked. It can only be likened to an intellectual starvation, and we became dependent upon various methods of whiling away the tedium of the march, even to counting the number of our steps.

The Effect of a Cold Trip upon the Constitution was very noticeable, though no definite symptoms could be observed. In any trip extending up to a week, where the temperature was continuously below −40° F., the men returned in very poor condition. During this time one never while in the sleeping bag got any continuous sleep, and once or twice there were authentic instances of men sleeping while actually under way. This want of sleep caused a general lowering of the constitution, so that lassitude after a cold sledging journey is a thing always to be remembered. After these cold trips the feet, which had been in continuous contact through the Finneskoe with the cold snow, became very much congested. This congestion lasted for some time after the return, and gradually wore off. I believe it was simply a compensating effect.

The Results of the Strong Light and also its reflection from the snow were marvellous as regards the deep pigmentation of the skin. Members crossing the Barrier became very nearly the colour of negroes, and this was entirely due to the effect of the strong light.

Men who returned from the southern journey were extraordinarily weak in certain of their muscles. They could have pulled the sledge throughout a very long day, but whereas before leaving they could have lifted 100 lb. easily, on their return after three months there was some difficulty in lifting even 30 lb. Certain muscles became trained, and could go on almost automatically.

Th[illegible] D[illegible] [illegible] by Sh[illegible] is evidently from p[illegible] experience a [illegible] can be readily s[illegible] party of men [illegible] compressed [illegible] a long period [illegible] fed on meat [illegible] frequent diarrho[illegible] the first few days after the return from [illegible] well to restrict the diet [illegible] live on soft foods [illegible] is possible Shackl[illegible] when he reported [illegible] came down to his last pony [illegible] and there the [illegible] a well earned meal On each occasion [illegible] the attacks of [illegible] supervened D[illegible] in these climes The ponies which were [illegible] the foot of the Beardmore were covered with snow and when the first parts [illegible] the carcases were in parts uncovered the [illegible] being horrible Saprophytic bacteria were already pr[illegible] the dark meat [illegible] warmed by the sun rapidly decompos[illegible] This may be [illegible] as an aggravating cause of the enteritis

WOUNDED TREATED AT THE ROYAL NAVAL HOSPITAL, SHOTLEY

By Fleet Surgeon CHRISTOPHER [illegible]
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] where these shell fragments had [illegible] distance, it was found more satis[illegible] opening and push them out, rather than [illegible] through the entrance wound.

[illegible] I may mention that the precise location [illegible] of the X-rays was often a matter of [illegible] frequently found in quite a different [illegible] of the radiographs would lead one [illegible]

[illegible] were of every shape and size, and only [illegible] which were always sharp and serrated. [illegible] a few grains to four ounces, and on their [illegible] pushed before them such foreign bodies as [illegible] wood, fragments of bone and pieces of cork [illegible] which were frequently found embedded in the [illegible]

[illegible] evidence to show that at the time of entry [illegible] were at a high temperature, the edges of the [illegible] and charred, and the blood vessels in some cases shrivelled up and calcined as if touched by a cautery. [illegible] to the temperature of the shell I think is to be attributed the comparatively little hæmorrhage which occurred from some of the larger wounds.

Many of the shell wounds were of great extent, large pieces of the tissues being blown away *en masse*, and the edges of the cavities left so crushed, seared and pulverized, that nothing in the way of plastic surgery was possible. As many cases were not received till a considerable time had elapsed after the injury, often as much as forty-eight hours, little in the way of treatment was possible beyond gentle irrigation with weak antiseptic lotions, and the insertion of large tubes to provide efficient drainage.

In the case of compound fractures, and of joints which had been opened, if the cases were seen within twenty-four or thirty-six hours of the infliction of the injury, the surrounding skin was disinfected, the wounds swabbed out thoroughly with a strong antiseptic (equal parts of 1 in 40 carbolic acid and 1 in 500 perchloride of mercury) and sterile dressings applied, in the hope of destroying any septic organisms which had found an entrance; but, although in some cases this treatment met with success, in others it was necessary to open up again and drain freely. In the compound fractures and joint injuries, where amputation became necessary, the question of where to remove the limb became a matter for

[illegible] [illegible] was [illegible] [illegible] [illegible] [illegible] [illegible] healing [illegible] some con[illegible] apparently [illegible] of tissue [illegible] and [illegible] with [illegible]

Shell Wounds of Head and Face

Examples [illegible] besides superficial and deep wounds through the soft [illegible] comprised the following: —

A fracture of the base of [illegible] compound fracture of the vertex, fractures of the [illegible] and superior maxillary bones, a case of avulsion of the [illegible] of the nose, several cases of complete [illegible] wound through the cheek with laceration of the tongue [illegible] wound through the parotid gland, and a wound of the [illegible] the carotid sheath.

The compound fracture [illegible] which was in the frontal region at first appeared trivial as [illegible] wound was examined only [illegible] could be discovered through the outer table of the cranium. [illegible] however were [illegible] and on [illegible] it was discovered that a large portion of the [illegible] had been [illegible] and had been driven into the [illegible]. The case proved fatal. Although all fragments of bone were [illegible] of the sub-dural space had [illegible] subsequently formed. It is difficult to account [illegible] no shell fragment was [illegible] it was conceivably caused by a [illegible] with some small [illegible]

Shell Wounds of the Thorax

One case was admitted where the clavicle was shattered, the first rib fractured and the apex of the lung exposed for an area of about a square inch at the bottom of the wound. There was extensive surgical emphysema over the back and side of chest, but

no hæmoptysis. [illegible] becoming gradually absorbed and [illegible] over the lung.

Shell Wounds of [illegible] Abdominal Viscera.

Most of the [illegible] in the mortuary, patients having [illegible] and hæmorrhage. Amongst these were [illegible] practically disembowelled, and in [illegible] place almost instantaneously.

One man wh[illegible] suffered from a shell wound in the right hyp[illegible] with an exit wound near the [illegible] had grooved the peritoneal surface [illegible] but with it a long piece of omentum wh[illegible] and torn. The intestines, however, had [illegible] and the man would probably have survived had not [illegible] wound been associated with [illegible] both lower limbs.

A case which [illegible] the crest of the right ilium [illegible] superior spine presented [illegible] The initial shock which was severe [illegible] patient seemed to be progressing [illegible] suddenly collapsed with epigastric [illegible] of blood and a rapid thready pulse [illegible] distension with some rigidity [illegible] later. An autopsy showed that [illegible] had travelled upwards and inwards [illegible] along the line of the attachment of the mesentery [illegible] branches of the gastro-duodenal [illegible] lodging behind the duodenum [illegible] The lower end of duodenum and about [illegible] jejunum were robbed of blood supply of [illegible] colour and about to become gangrenous. There was considerable internal hæmorrhage along the attachment of the mesentery. The probable cause of the sudden collapse was fresh hæmorrhage into the retroperitoneal tissue.

A shell wound in the loin was associated with injury to a kidney, severe hæmaturia occurring and persisting for about a fortnight. No shell fragments could be discovered either by probing or by the X-rays, and with rest and free drainage a complete recovery ensued.

Injuries to Nerves

Injuries to [illegible] nerves with [illegible] were fairly [illegible].

The seventh nerve was divided in a case wh[illegible] was severely [illegible] and paralysis of the whole [illegible] face has resulted.

In one [illegible] wound near the elbow th[illegible] was found to be [illegible] divided and after the [illegible] carefully [illegible] they were united by catgut [illegible]. Although this wound has suppurated the nerve sutures [illegible] and a complete [illegible] of sensation and function is [illegible].

Injuries to Arteries

In two [illegible] which were brought in dead and [illegible] in the mortuary the femoral artery and vein had been severed in Scarpa's triangle.

A third instance [illegible] main vessel was a shell wound near the bend of the elbow where the brachial artery had been divided; the proximal end of this vessel was found on operation to be completely occluded, being [illegible] and twisted on itself for about 2 ins., which happy result was undoubtedly to be attributed to the high temperature of the [illegible] shell causing the injury.

Injuries to Muscles

A kind of local gangrene frequently occurred subsequent to these extensive shell injuries of muscles, dead gangrenous shreds of the muscular tissue, often with a portion of tendon attached, slowly separating and being cast off; this undoubtedly resulted from the crushing and pulping to which the tissue had been subjected and was in some cases hastened by [illegible] charring from the high temperature of the metal.

Any immediate attempt to restore continuity of tissue was thus seen to be out of the question and one had to be content with cleaning the wound and providing for efficient drainage by the insertion of large sized rubber tubes.

One case, that of a German officer, proved rather an exception to the rule; a transverse wound across the middle of forearm severed all the superficial flexor tendons without injuring the larger vessels and with comparatively little bruising of the tissues. In this case the divided ends of the muscles were united by stout catgut, the wound being closed and the limb put up in a suitable

position on [illegible] a little massage [illegible] were regained.

Injuries [illegible] of Bone

It is [illegible] fractures [illegible] with fractures [illegible] formation [illegible]

[illegible] fragments [illegible] the [illegible] to [illegible]

Although comminution was the rule [illegible] to such an extent as to leave large gaps [illegible] of the bone, several important exceptions were [illegible]. Among these may be mentioned two compound fractures [illegible] when the bone was obliquely fractured [illegible]. The general plan of treatment [illegible] comminuted fractures was:—

(1) If injury was fairly recent patient was put under [illegible] and the wound thoroughly swabbed out with iodine solution [illegible] solution made up of equal parts of carbolic [illegible] perchloride lotion (1 in 500), sterile gauze [illegible] applied.

(2) If patient was not received till some considerable time had elapsed [illegible] large drainage tubes were inserted [illegible] with some weak antiseptic lotion (tinct. iodine [illegible]) [illegible] same solution.

Now that the application of pure carbolic acid has been so highly recommended its use will be adopted in future instead of the above-mentioned antiseptic solutions for the first class of cases.

When large joints were hopelessly shattered no time was lost and amputation was performed as soon as the parts could be prepared, but in cases which were on the border line, so to speak, and where a reasonable hope could be entertained of saving the limb, treatment much on the lines of the compound fractures was followed and the question of amputation was postponed. Injuries to the interphalangeal joints and to the joints of the carpus and tarsus were common, and although in a few cases owing to extensive crushing it was necessary to remove the toes and fingers

affected in a number of others free drainage and cleanliness eventually led to the parts being saved and preserved as useful appendages

Where pieces of shell had passed through these smaller joints early movement and massage was found to be of the greatest importance

In the case of injury to the larger joints, where it had been possible to avoid amputation by resorting to irrigation and free drainage, healing was necessarily a slow and tedious process and convalescence was much delayed

One of the most useful means of cleansing these large septic wounds, in connexion with joints or comminuted bone, was by occasional irrigation with a peroxide of hydrogen lotion (10 or even 20 vols per cent) which seemed to hasten the separation of the sloughs and promote healthy granulation

Secondary Hæmorrhage

In nearly all cases of extensive shell lesions which become septic secondary hæmorrhage is to be anticipated and may vary from a general oozing during the period of separation of the sloughs to a profuse hæmorrhage when one of the larger arteries has ulcerated In the former cases, plugging the wound with gauze or the application of a pad and bandage may suffice but in the latter these methods were found useless and it was always necessary to open up the wound freely and secure the bleeding vessel which was usually found to be of considerable size In such cases it would seem advisable to be prepared for a lengthy operation as the definition of the bleeding vessel is often a matter of considerable difficulty owing to the depth at which it has to be sought and owing to the gangrenous state of the tissues

The following vessels were those which it was necessary to tied and tie for profuse secondary hæmorrhage the suprascapular branch of thyroid axis, the long thoracic branch of the axillary and the peroneal branch of posterior tibial

The Effects of Lyddite Fumes

I could see no difference clinically between the effect produced on German seamen by the inhalation of fumes from lyddite shells and on our men by the fumes from German mines so I expect the noxious gases produced by the explosion in both are very similar and that the effect is due mainly to nitrous fumes, such as are

given off by the *burning* (not detonation) of almost any of the nitro explosives. These cases proved the most insidious and most rapidly fatal of any which came under treatment. Patients who were apparently suffering little inconvenience on admission rapidly became asphyxiated and died within twelve or twenty four hours with all the symptoms of an acute capillary bronchitis or bronchopneumonia which evidently resulted from the irritant action of the fumes on the air vesicles and mucous membrane of the bronchioles. They first complained of some pain and tightness across the chest which gradually became worse and was accompanied by cough, marked dyspnoea and the expectoration of blood stained frothy mucus. As the minute tubes became more and more blocked with mucus the dyspnoea and lividity became aggravated and violent efforts were made to aerate the blood as was seen by the sucking in of the supra-sternal, supra-clavicular and intercostal spaces with each breath. Respiratory distress became more and more marked, the inspiratory efforts became less effectual and patient gradually passed into a state of coma and finally became quite unconscious. The heart beat feebly for some time after respiration ceased and after death a copious discharge of blood stained frothy mucus from the mouth and nostrils continued.

As regards treatment there is little to be said. Some temporary benefit resulted from the use of oxygen and the bronchitis kettle but no medicines tried seemed in any way to retard the rapidly fatal progress. The use of atropine hypodermically has since been suggested and might possibly be attended with more beneficial results.

Burns from Explosives

The burns were in the majority of the cases limited to the parts unprotected by clothing, such as the face, scalp, forearms and hands, but the penetrating effect of the flash was seen in some instances where the flame ran up the trousers and burned the legs, notably in the case of an officer whose penis was badly burnt through the junction of the trousers in front.

These cases were mostly of a severe nature, the depth of tissue destroyed or degree of the burn being variously combined in the same patient and ranging from vesication in some parts to charring of the whole tissues as far as the underlying muscles. Primary shock and marked constitutional symptoms were rarely absent, the latter becoming more severe and being accompanied by pyrexia of a hectic type at the period of the separation of the sloughs. Secondary haemorrhage was not uncommon, and in a case where

reaction was slight, and the symptoms were mostly [illegible] alteration in the urine which contained albumin blood and a few casts

Bullet Wounds

The couple of bullet wounds treated were more or less trivial the bullets lodging in the soft parts of a limb and doing little damage

These projectiles were fired from a German machine gun and as they did not traverse the limb must have come from a great distance, or else their velocity had been much reduced by previous passage through some soft resisting substance like a barrier of hammocks they could not have ricochetted because the bullets when extracted were perfect and without a scratch on the cupro-nickel covering

Cases of Strains Contusions and Concussion

These cases presented nothing noteworthy to distinguish them from similar ones of everyday occurrence in every instance they were caused by men jumping overboard and striking themselves against projections on the side of ship or against objects floating in the water

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THE NAVAL ACTION OFF HELIGOLAND [illegible]

BY [illegible] WALTER K. HOPKINS, R.N. [illegible]

HAVING visited Shotley Sick Quarters after the arrival of the German minelayer "Koenigin Luise" and of [illegible] and having seen the wounded and cases of [illegible] lying there, I [illegible] convinced that the most important action on the part of [illegible] on board ship in charge of such wounded was a vigorous [illegible] tion of a way of antisepsis as early as possible. Suppuration had been very marked in many of the earlier cases, and [illegible] help feeling that this condition might in future cases be [illegible] ably reduced by early vigorous cleansing and antiseptic [illegible]

Having regard to the number of severe burns I thought it [illegible] to prepare a number of face masks and strips of picric acid [illegible] dressing ready for immediate use.

On 27th August we were hoping to meet the enemy early in the following morning.

On 28th August, at 3.4 a.m., "Action" was sounded off. [illegible] cruisers (supposed enemy's ships) having been suddenly observed had caused us to take up stations somewhat earlier than had been anticipated. It was quickly discovered, however, that [illegible] cruisers were our own. Shortly after this [illegible] sipped to each watch in turn, and at about 7 a.m. the enemy's ships were actually sighted. From this time on to [illegible] successive actions were fought between various [illegible] the two fleets.

The day was fine and calm, while the sun [illegible] very hazy atmosphere, in which patches of fog [illegible] visual distance from time to time.

I remained on the upper deck during the earlier part of the affair, and found it a most interesting and inspiring sight to watch our destroyers and the "Arethusa" and her divisions dashing at full speed after the enemy, while soon the frequent spurts of flame from their guns, the following reports, and the fountains of water and spray thrown up by the enemy's shells pitching short or over, began to create in most of us a suppressed excitement which we had not hitherto experienced, telling us that the "real thing" had begun, that an action was actually in progress.

Shortly our interest was to multiply fourfold when the order to fire our own guns was given. After a time shells beginning to drop

[illegible] I retired to my station [illegible] just below water line in the after [illegible] one of the few available places in a ship of this class wh[illegible] my party [illegible] men could be accommodated [illegible] the other half of the party in charge of the [illegible] steward being stationed at a similar [illegible] forward. [illegible] knowledge as to how matters were progressing we had to [illegible] fragments of information [illegible] the nearest [illegible] communication with [illegible] the upper deck.

[illegible] from time to time [illegible] shells [illegible], short and bursting, whose fragments [illegible] did not penetrate the ship's skin. It was a weird [illegible] by the [illegible] who [illegible] and at the [illegible] full expected the moment to see [illegible]. As a matter of fact the shell entered some [illegible] the Lieutenant-Commander's [illegible] this [illegible] the "Mainz" [illegible] to thank. The [illegible] highly [illegible].

[illegible] charmed life [illegible] shells [illegible]—she [illegible] sides [illegible] twenty three holes [illegible] and yet her list [illegible] eight wounded [illegible]. She also [illegible] being torpedoed [illegible] torpedo passing [illegible] from a [illegible].

[illegible] the upper deck once or [illegible] that all was correct. [illegible] I should say the [illegible] than a modern [illegible].

The Wounded of the "[illegible]"

It was not till the latter part of the afternoon that I was called upon to deal with any wounded, and then a rapid succession of six [illegible] either helped or managed to walk to the [illegible],

Then duly assisted [illegible] I spent the next [illegible] most part [illegible] as possible. It should be added that at this stage [illegible] by hypodermic injection to the [illegible] during the night. It was found [illegible]. The procedure in detail was as follows: —

(1) Careful removal of clothes.
(2) Removal [illegible] and a variety of pieces of clothing [illegible].
(3) Thorough washing of [illegible] very soapy [illegible].
(4) Douching with warm [illegible].
(5) Douching with [illegible].
(6) Washing this away [illegible].
(7) Drying the wounds [illegible].
(8) Reapplication of iod[illegible].

In the case of wounds [illegible] cleansed. In the case [illegible] around the wound as well as the [illegible]. Shaving where necessary [illegible].

In the case of burns all [illegible] and hair were removed as far as possible [illegible] such large areas as the whole length [illegible] tips to shoulder as well as the [illegible] chest, were involved. [illegible] a small area being dealt with at a time. [illegible] were strips of picric acid lint [illegible] masks cut into strips [illegible] pain quickly and the cases [illegible] been treated with greasy applications [illegible] the cleansing process.

Of the total of 27 cases there [illegible] shell and splinter wounds [illegible] Germans.

The type of wounds were [illegible] lacerated and punctured, deep or shallow, of all shapes and sizes, with several [illegible] causing compound comminuted fractures.

The following were some of the most interesting cases:

(1) A German seaman, a brawny young fellow, suffering much pain and considerable loss of blood from a wound in his left foot. Examination showed the presence of a piece of metal, embedded in the lower part of the tarsus, from underneath which steady oozing of blood was occurring. I put the patient under chloroform, and he was kept lightly under

[illegible] the Paymaster, which [illegible] fragment of [illegible] loose bone. The [illegible] difficult [illegible] owing to the [illegible] piece of [illegible] pointed [illegible] embedded in [illegible] so firmly that it was [illegible] of [illegible] eleven or more [illegible] fragment [illegible] its removal gave the [illegible]

[illegible] struck with multiple [illegible] He [illegible] pain in the right [illegible] The humerus was [illegible] Near the [illegible] small clean cut [illegible] cause of [illegible] fragment of steel [illegible] patient was much [illegible] and obtained some [illegible]

[illegible] fracture of right [illegible] and [illegible] due to a large wound in [illegible] neighbourhood of [illegible] Multiple [illegible] scalp wound. This [illegible] from severe [illegible] wandering [illegible] The wound [illegible] was found [illegible] the skull [illegible] the left frontal [illegible] He died after [illegible] in hospital.

OFFICERS WOUNDED

[illegible] was brought with [illegible] He had [illegible] shell [illegible] of right thigh [illegible] passing deeply [illegible] muscles. He was very [illegible] anxious [illegible] to his work which he did after two or three weeks.

[illegible] lieutenant of the line [illegible] which [illegible] He had been [illegible] the right [illegible] by a piece of shell [illegible] thrown [illegible] the ship [illegible] of the water [illegible] the lower right [illegible] He was passing blood [illegible] and a good deal of [illegible] had pass[illegible] type of [illegible] had been [illegible] well and wrote to me [illegible] saying that he [illegible] completely [illegible]

[illegible] was rather [illegible] in several cases where [illegible] Dressings [illegible] One case in [illegible] A powerful English seaman [illegible] wound in the [illegible] thigh had [illegible] lung [illegible] comfortable position [illegible] He lived and [illegible] Dressings which had been freshly put on [illegible] or so [illegible] had suddenly become saturated with blood. Repacking

and bandaging of the wound [illegible] Patient was found to have some [illegible] of wound.

Shock was present in several [illegible]

The courage and endurance of [illegible] were admirable. In only one case did I hear any [illegible] and this was in one of the less severely injured. [illegible] that many wounded were in immediate [illegible] and were enduring their troubles cheerfully [illegible] after a little refreshment he was [illegible] the Germans were at first rather sullen but their [illegible] was soon gained when they found that I could speak to them in their own language and that we were intent upon doing [illegible] for them.

I found bovril, brandy, slops [illegible] with milk most useful and acceptable for those who [illegible] At first one or two of the Germans hesitated [illegible] what was offered them but they soon thawed and took the [illegible] gratefully and in fact their gratitude [illegible] for what had been done for them was remarkable.

I was able to report to the [illegible] that all cases had been [illegible] and made as comfortable as circumstances would allow.

On arrival at Harbour [illegible] August the more serious cases were transferred to [illegible] the others to the hospital ship [illegible] the former cases [illegible] turned to the ship [illegible] Curiously enough [illegible] I could not sleep well [illegible] but I had passed a very interesting [illegible]

I would add that I [illegible] of these patients in the early stages [illegible] was much gratified some time later [illegible] that the cases from the [illegible] had progressed more favourably than earlier ones received, and that this was [illegible] the fact that they had received very early and thorough [illegible]

II

WOUNDED TREATED AT THE ROYAL NAVAL HOSPITAL, CHATHAM

[illegible]

[illegible] from the [illegible] the [illegible] of the [illegible] between [illegible] treatment [illegible] approaching [illegible] formed [illegible] when [illegible] for [illegible] shell. [illegible]

[illegible] all wounds [illegible] Antiseptic vaccine was [illegible] and [illegible] prophylactic [illegible] where wound [illegible]

Of the [illegible] of tetanus [illegible] wounds caused by [illegible] Notes of this case [illegible] period was fifty-two [illegible]

Cases received from the [illegible]

Shell Wound [illegible]—[illegible] right [illegible] ramus of pubis [illegible] drained [illegible] at [illegible] days then improved. [illegible] formed [illegible] and lower [illegible] ment removed [illegible] *coli communis* [illegible]

Shell Wound [illegible]—[illegible] tered by bursting shrapnel. [illegible] board, but suspended [illegible] collapsed with tourniquet on brachial artery. [illegible] at junction of upper and middle third of humerus. [illegible] well

Shell Wound of [illegible]*.*—Penetrating wound of [illegible] [illegible] collapsed. [illegible] in posterior [illegible] of globe.

Shell Wound of [illegible] *and Thigh.*—Compound comminuted [illegible] forearm. Extensive lacerated [illegible] communicating with wound on [illegible]. Forearm wound freely enlarged, shell [illegible] pieces of bone removed. Wound drained [illegible] opened up [illegible] found to communicate [illegible] established. Subsequently [illegible] abscess [illegible] peritoneal cavity [illegible] was performed in [illegible] well.

Shell Wound [illegible]*.*—Left [illegible] joint shattered by bursting shell. [illegible] vessels [illegible] well.

Shell Wound of Foot.—[illegible] wound [illegible] situated [illegible] showed [illegible]. Wound enlarged and [illegible] from [illegible]. Wound [illegible].

Shrapnel Wound of Leg and Foot.—[illegible] Right leg [illegible] shell. [illegible] joint had been [illegible] joint on [illegible] wound of left foot [illegible] shell fragment [illegible] removed. Amputation [illegible] well.

[illegible] shoulder [illegible] by [illegible]. Compound [illegible] fracture of several left [illegible] of scapula extending [illegible] and fracture of [illegible] position. Brachial plexus [illegible]. Six weeks afterwards [illegible] elbow, no return of [illegible].

[illegible]

Shrapnel Wound of Face.—[illegible] upper jaw, entrance wound [illegible]. Several teeth and [illegible] by operation

Shrapnel bullet found fixed in left alveolar plate having passed through upper jaw from right to left. Bullet removed. Large perforation of hard palate. Antisepsis serum given. Progressing well.

Shrapnel Wound of Neck.—Tracheotomy had been performed before admission. Two lacerated wounds on left side of neck, one behind angle of jaw leading to the pharynx, the other just below body of the jaw leading forwards and downwards to left side of trachea. Both wounds septic. Skiagram showed shrapnel bullets lying at ends of sinuses. Wound tracks opened up and cleansed. Both bullets removed, that from the lower track being approached from the mouth and removed through the pharyngeal wall. Antisepsis injections given. Progressing well.

Shrapnel Wound of Leg.—Compound fracture of left tibia and double fracture of fibula. Entrance wound over lower third of tibial crest. No exit wound. Very septic. Wound opened freely, displaced fragments reduced and drainage established by counter opening in back of leg. Hectic temperature for some days. Wound cleaned gradually and limb subsequently put up in plaster of Paris with Hackenbruch's extension apparatus. Antisepsis vaccine given.

Shell Wounds of Arm and Face.—Comminuted fracture, shaft of right humerus. Entrance wound on inner and posterior aspect. Exit wound on outer surface 2 in. above condyle. Lacerated wound right upper eyelid extending inwards to inner angle of orbit, with rupture, collapse, and considerable chemosis of the globe. Skiagram showed shell fragment, which had perforated floor of orbit, lying at the back of hard palate. Wounds septic. Enlarged, cleansed and tube drainage established. Arm put up in inside rectangular and outside splints. Enucleation of eyeball twenty-five days after injury, when orbital wound had completely healed. No attempt to remove shell fragment. Antisepsis vaccine given.

Shrapnel Wounds of Knee-joint.—Admitted with several small penetrating wounds around left knee-joint and a circular sloughing wound on the outer surface of leg 2 in. below head of fibula. Also burn of second degree below popliteal space. Effusion into joint. Febrile temperature and pulse. Skiagram showed shrapnel bullet embedded in head of tibia close to joint. All wounds septic. Hectic temperature followed for some days, but no local signs of pus in the joint. Thorough antiseptic treatment adopted. Antisepsis vaccine. Progress slow but steady. Wounds cleaning and healing. Effusion subsiding. No attempt to remove bullet. Prospect of a good functional joint.

A second case occurred in an officer who was shot in the left

knee whilst reconnoitring in a motor car. Entrance wound ½ in in diameter over the inner tuberosity of the tibia. No exit wound. Several small splinter wounds over upper aspect of leg. Ten days under treatment in a French hospital. Margins and track of wound sloughing. Slight painless effusion into joint. Skiagram revealed bullet lodged in the inter-condylar space and two small metal fragments embedded in ligamentum patellæ. Back splint and antiseptic dressing. Sloughs slow in separating. Effusion quickly subsided. Discharged to complete convalescence at his home, with a painless movable joint.

Shrapnel Wound of Foot.—Penetrating septic wound dorsum of right foot. Comminuted fracture third metatarsal bone, also severe scalp wound, with much loss of tissue but no fracture or erosion of bone. Skiagram showed shell fragment lying on plantar aspect of second metatarsal bone. Removed by plantar incision and through drainage provided.

Shell Wound of Leg.—Compound severely comminuted fracture of left tibia lower third. Entrance and exit wounds bathed in pus. Large suppurating hæmatoma over lower two-thirds of anterior and internal aspect of limb. Freely opened, drainage established through wounds and counter opening, and limb splinted. Febrile temperature for several days. All wounds discharged freely. Twelve days subsequently a collection of pus formed over internal malleolus. Opened and drained. Small loose fragments of bone removed. All wounds now healing and good progress is maintained. Antisepsis vaccine given.

Multiple Shell Wounds—Pneumonia. Death.—Admitted seven days after receipt of injuries. Very ill and weak. Temperature 102, pulse 120. Circular penetrating wound in upper right gluteal region leading to drum. Two lacerated wounds in lower left gluteal region communicating with a wound in upper and posterior aspect of thigh. Lacerated contused wound middle of inner aspect of left leg. All wounds septic and showing much contusion and destruction of tissues. Shell fragment protruding from leg wound removed. Skiagram showed shell fragments in right and left buttocks and over sacrum. In addition there were several splinter wounds distributed over back and face. All wounds cleansed and dressed antiseptically. Eighteen hours after admission pneumonia developed and despite all treatment death occurred within thirty-six hours. Trismus was observed twelve hours before death, but no other muscular spasm of trunk or limbs.

Antitetanic serum was given. Blood examined, but the tetanus bacillus not isolated.

WOUNDED TREATED AT THE ROYAL NAVAL HOSPITAL, PLYMOUTH

By THE MEDICAL OFFICERS

The work of this hospital only began to [illegible] character with the arrival, on the 15th October of [illegible] of 633 sick and wounded Belgian officers and men.

Among the cases were upwards of 250 suffering from various medical affections more or less directly connected with the prolonged periods of exposure and fatigue to which the men had been subjected. Thus not less than 133 cases were included under [illegible] rheumatism, lumbago and sciatica, whilst about 90 were suffering from bronchitis and other affections of the lungs. A further group of about 150 included a variety of surgical affections and injuries other than those of gunshot wounds, among [illegible] and sprains, fractures and ordinary wounds [illegible]. In the case of the wounded the injuries were in [illegible] weeks duration.

The wounds caused by rifle bullets and shells numbered [illegible] 200, and can be grouped together with those [illegible] in the English wounded admitted a fortnight later. These [illegible] of 212 officers and men reached Plymouth by hospital [illegible] 29th October and consisted almost exclusively of wounded [illegible].

Among these cases the wounds were much more [illegible] in most instances been received a week or less before the [illegible] admission. The wounds by bullet and shell in [illegible] numbered 186 in 152 individuals. Grouping together [illegible] in the two series of cases the total is 389.

The following table gives the position and condition [illegible] wounds in those produced by rifle bullet and shell [illegible].

Among the cases in which a bullet had traversed the [illegible] part of a limb it was frequently noticed that even in the [illegible] of bone or joint injury a considerable degree of stiffness of the [illegible] persisted after the wound had healed, with limitation of the movements of the neighbouring joints and with a tendency to muscular contracture. This was especially noticeable in [illegible] wounds of the forearm and leg.

Among the nerves injured were the musculo-spiral, median, ulnar, great sciatic, and external popliteal.

In one case of median nerve paralysis the bullet track wa[illegible]

tun[illegible] [illegible] at one end which admitted a fine probe [illegible] [illegible] short [illegible] On exposing the nerve it was found to be s[illegible] [illegible] by a [illegible] dark substance which proved to [illegible] of linty material from clothing incorporated in scar tissue. Th[illegible] was dissected away and the nerve set free

Bullet and Shell Wounds

	Rifle Bullet		Shell	
	Healing or healed	Suppurating	Healing or healed	Suppurating
Head	15	3	9	8
Neck	6	1	4	—
Chest	8	2	4	—
Abdomen	2	—	1	1
Back	2	3	5	3
Perinaeum	—	1	—	—
Penis	1	—	—	—
Hip buttock, groin (with scrotum 1)	14	2	5	6
Thigh and knee (with scrotum, 3)	23	12	13	9
Leg and ankle	16	15	8	9
Foot and toes	13	7	6	6
Shoulder	12	7	6	5
Arm and elbow	7	8	8	3
Forearm and wrist	17	13	7	1
Hand and fingers	11	21	7	9
Multiple	1	1	—	—
	147	99	83	60
Totals	246		143	

In another case of healed bullet wound of the fore arm, a peculiar spastic condition of the flexors of the fingers and muscles of the thumb was present and there was marked impairment of sensation of the hand and fingers, the only definite feature elicited from the patient, a Belgian, being that "the little finger was all right." Operation revealed a flat white scar covering the median nerve at the level of the upper border of the pronator teres. This was removed and the nerve wrapped in Cargile membrane. By the

third day the spastic condition of the hand was less and the patient could voluntarily flex the last joint of the thumb.

Even in cases presenting no obvious evidence of nerve lesion, areas of impaired sensation in the limb were found in several instances, and would probably prove not uncommon if systematically searched for in a series of cases. In the case of an officer who had been shot antero-posteriorly through the middle of the leg there was well marked impairment of sensation on the dorsum of the foot and on the two inner toes. The extensor brevis digitorum was also paralysed, thus suggesting an injury of the anterior tibial nerve.

The remarkable absence of symptoms often observed in cases in which a rifle bullet has traversed important structures is well known. In one Belgian soldier a bullet entered the chest at the level of the ninth rib in the left mid-axillary line, and was removed from beneath the skin over the ninth rib on the right side, at a point rather anterior to that of entry. The bullet must thus have passed through the pleura, liver, stomach, and probably the spleen. No ill results followed, although the occurrence of a rigor, a temperature of 104.4° F., five weeks after the injury, with some rigidity of the right rectus, suggested the possibility of subphrenic suppuration. Three weeks have since elapsed, and the man remains well.

In another case a shrapnel bullet entered the right side of the back of the neck and passing forwards into the lower jaw on the same side, knocked out the wisdom tooth and partially fractured the bone. The bullet was easily removed from the alveolus.

The treatment of suppurating wounds with hydrogen peroxide and iodine baths has been attended with good results, the dressings consisting of cyanide gauze or boric fomentations, according to the profusion of the suppuration and the amount of the surrounding inflammatory swelling. X-ray examination in such cases is very advisable, with the object of detecting the presence of metallic foreign bodies or bone injury. Even when such examination is negative, exploration under an anæsthetic is often advisable, in order to secure free drainage and removal of any fragment of clothing which may be present.

Many of the bullet and shell wounds of hands and fingers were admitted in a very septic state, but the majority rapidly improved with treatment. In the hand the bullet often passes through from dorsum to palm, and the aperture of exit presents an appearance as if the part had been burst open. In such cases X-ray examination has frequently shown comminuted fractures of the metacarpals

and the appearance of several hands, thus damaged, suggests that healing will be delayed by a varying degree of necrosis. In the case of the fingers amputation may be unavoidable, but in general conservative treatment has been adopted. This has especially applied to those cases in which the ends of two or more fingers had been blown away and septic stumps remained.

The operations performed in connexion with the series of 389 wounds numbered 76, excluding a number of trivial procedures such as the removal of a subcutaneous foreign body. The operations were as follows: exploration and drainage of septic wounds, 15; removal of bullets, &c., 11; amputation of fingers, 9; for injury of nerves, 3; suture of tendons, 1; removal of eye, 2; for fracture of skull, 1; for abdominal abscess, 1; ligature of subclavian artery, 1; amputation at shoulder, 1; amputation of thigh, 1.

The amputation of thigh was performed successfully for an intensely infected comminuted fracture of the upper end of the tibia caused by a rifle bullet at short range. The man after being shot had crawled about unhelped for four days.

The amputation at the shoulder, performed on the day of writing, was undertaken for a bullet wound of the axillary artery, with profuse suppuration and followed by gangrene of the limb.

Among the operations performed before admission were amputation of thigh, 2; drainage of suppurating knee-joint, 1; removal of bullets, &c., 11; and several amputations of fingers.

Two major operations were successfully performed on board the hospital ship—trephining for gutter fracture and amputation of the arm for emphysematous gangrene. Except in those cases in which a bullet or fragment of metal could be felt beneath the skin or by probing a wound, the presence and position of the foreign body was determined by X-ray examination.

In all 180 cases were examined in the X-ray department. In 53 cases bullets or fragments of metal were found: rifle bullets in 15, shrapnel bullets in 13, and fragments, often multiple, in 25. In 17 cases fractures were present and in 30 the absence of bone injury was determined. In one case a rifle bullet had drilled a small hole through the upper end of the tibia. In another case a shrapnel bullet was localized in the base of the right lung and could be seen rising and falling with the diaphragm. The method of localization usually adopted is described by Surgeon Bradbury, R.N., in the present issue of the Journal, p. 40. In cases in which it was particularly important to determine the relation of the foreign

likely to a bone, the stereoscopic or the triangulation method was also used.

In dealing with bullets or metallic fragments localized by X-ray methods, and in the absence of an unhealed wound in the immediate vicinity, the incisions were planned with a due regard to the anatomy of the part and in only three cases was the search abandoned. Two of these were small fragments, and might well have been left alone; in one a shrapnel bullet, thought to be lying on the back of the sacrum was found by rectal examination to be lying in front of the bone. Indeed the presence of a bullet, detected only by X-ray examination, in the entire absence of symptoms or disability, and in the absence of an unhealed wound likely to be kept open by it, does not necessarily call for an operation.

One fact, often mentioned by others, was frequently noticed—the difficulty of feeling a bullet, even a large round shrapnel, in the tissues of the operation wound. This applies particularly to a probe and renders the use of a finger often unavoidable. When a fracture is present, particularly if comminuted, the difficulty of distinguishing metal from bone has been found to be very great, and in such cases, as well as in those in which a metallic fragment is present in a sinus, the telephone probe has proved of real utility.

In two cases in which the tract had otherwise healed, the retained bullet was found to be lying in a small abscess cavity, in one case situated beneath the insertion of the brachialis anticus muscle.

It was frequently noticed that the rifle bullet, before coming to rest in the tissues, had turned so that its apex pointed more or less towards the site of entry. In some cases this was doubtless due to contact with a bone, but may have been explained, as has been suggested, by the fact that on account of the extremely conical shape of the bullet the centre of gravity is so near the base. It may well be supposed that in some cases, the extensive damage produced at the aperture of exit may be due to the bullet leaving the body broadside on or base first.

Tetanus antitoxin has been very freely used, and no case of tetanus has so far occurred in the hospital.

A SIMPLE METHOD OF LOCALIZING BULLETS

By Surgeon S BRADBURY MB DPH RN
Radiographer Royal Naval Hospital Plymouth

After trying various methods of localizing bullets the following has been adopted, and has been in use in this hospital since the outbreak of the war I am indebted to Dr Hernaman-Johnson for the suggestion of using a strip of lead, but I venture to think that the following modification simplifies his method It is applicable to all cases, and does away with the necessity of rotating a badly injured limb through a right angle—an essential in his method—moreover, there are many positions in which the bullet

Fig 1

may be situated where his method does not give the point on the skin nearest to the bullet (see fig 1) Here the surgeon, using Dr Hernaman-Johnson's method would make his incision at point C whereas X is the point nearest to the bullet

Fifty four bullets have been localized and in only two cases has there been the least difficulty in finding the bullet on the operating table The part is screened, and the anticathode placed vertically underneath the foreign body Two markers are placed

on the part, one above and one below in line with the bullet. These points are marked on the skin (A and B in fig 2). The part is rotated through a few degrees and the process repeated, the points C D being marked. A strip of sheet lead about ½ in wide is now moulded to the limb, and the four points A, B, C D, marked on the lead. The lead strip is then removed from the body or limb and its curve accurately traced, the four points being marked on paper. The points A and B, C and D, are joined and the intersection of these lines at F represents the position of the

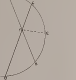

FIG 2

bullet. A line is drawn from F to the nearest point E of the curve, which is the point on the skin nearest to the bullet. The distance between E and F gives the depth at which the bullet is situated. The distance between B or C and E is measured and the point corresponding to E is marked on the skin with silver nitrate.

The rotation of the part prior to making the second examination must be done through only a few degrees or otherwise it would be impossible to remove the lead strip without altering its curve.

In cases where the surgeon wishes to know the position of the bullet in relation to bone, either the stereoscope or triangulation method is used in addition to the above.

REPORT ON THE TRANSPORT AND TREATMENT OF WOUNDED IN THE HOSPITAL SHIP "PLASSY."

By Fleet Surgeon M. L. B. RODD, R.N.

Two trips were made from Calais to Southampton with Belgian soldiers, and two trips from Dunkirk to Cherbourg with French others 2,023 wounded in all being conveyed by the hospital ship "Plassy."

Some of the wounds were very slight, but the majority were of incredible severity. These conditions appear to be caused by the large number of anaerobic micro-organisms found in the soil. The presence of these germs is stated to be due to the intense cultivation of the lands in Belgium and France, which would seem to teem with tetanus, *Bacillus aerogenes capsulatus* and other anaerobic germs. In trenches dug out of this soil the soldiers stand for hours and sleep there get their clothing soiled and wet, and necessarily the skin of their hands and face. Under these circumstances the severity of the wounds and the onset of tetanus, &c. is not to be surprised at. I was struck with the lack of shock, but there was, however, a much lowered vitality. This was treated with rest and stimulants brandy and bovril, which in some cases were given together. The wounded Belgians and French were transported to the base where we received them in ambulance trains. These consisted of ordinary horse vans for cot cases. They had been cleaned out and fitted with steel uprights, to which were attached steel shaped supports. These supports, as shown in above diagram, exactly and accurately fitted the French Service stretchers so that once on the stretcher the patient was taken to the ambulance train, and thence to base hospital without again being taken off the stretcher. This method is to be commended. Each van carried eight cots. The stretchers were quite simple canvas stretched and attached to wooden poles, strengthened underneath by galvanized iron rods. They stood on the ground on four small runners. The walking cases were accommodated in the ordinary passenger service. A food van, with chef, fire, stove, &c., was attached to the train. The splints used were principally of cardboard, but there were some very efficient of wire. A considerable number of splints had to be expended on board, especially long Listons and one McIntyre. The French first field dressings

were good, and iodine appeared to have been used. In some cases the bandages were too tightly applied with disastrous results.

I visited the French hospital ship "La Bretagne." No ward accommodation was prepared and cabins were used for cot cases. The first saloon was fitted with stretchers as cot cases, which were prevented from movement when the ship rolled by pieces of wood nailed to the deck, and arranged to exactly fit the legs of the stretcher. This commended itself to me as a quick method for a hospital carrier, and much movement of the patient was avoided. In the centre of the saloon for the patients was an operating table and equipment, which naturally could only be looked upon as an emergency fitting. The majority of French soldiers had received antitetanic serum, this fact being noted in each case on a label attached to patient's clothes with the diagnosis, &c. One case of tetanus in a French soldier occurred on board. No injection was given on board nor had he received any before embarking. None was given in this ship because he had trismus and contractions. It was then not considered of any value. Instead he was treated by injection of morphia and large doses of chloral and bromide. He was landed at Cherbourg and sent to a special hospital. At this hospital Dr Santz stated the following was the treatment: "The sick attacked with tetanus are treated by subcutaneous injections of a solution of phenol in water, 2 grm per 100 millilitre (2 per cent), as soon as possible. Two injections of 10 min (12 drm) are given, one in the morning and one in the evening. I have never met with any accident. If the injections can be given early I prefer to give them in the wounded region. In addition patients are given large doses of chloral, and also morphia."

The bullet wounds of minor degree had small entrance and exit wounds, were scabbed over, aseptic, healing rapidly and causing no trouble. They had apparently been dressed with iodine and cyanide gauze dressing. This scabbing prevents the entrance of micro-organisms, efficiently seals the wound and should not be removed. Other bullet wounds had caused large wounds of exit, and in some cases this appeared to be due to the turning over of the bullet on its long axis, thus making a much broader projectile than when pursuing its course in a direct line with its axis. Hence there is necessarily much greater resistance offered by the tissues, for a larger wound results. These bullets coming in direct contact with the bones caused great comminution, especially in the skull. The bullet wounds of the skull were instructive and interesting, for all had signs of paralysis, &c., from compression, which called

for immediate operation Five operations for this condition were performed on board, *vide* Cases As far as one could judge since they were so short a period on board the operations were successful but with such laceration of brain tissue after effects such as mental deficiency, will probably follow All these cases were compound and comminuted fractures. At the entrance wound, the comminuted bone was driven into the brain tissue and in some cases deeply At the exit wound, the comminuted bone was driven outwards

The shrapnel wounds had a fair sized entrance with large exit The entrance wound was irregular undermined and charred, the exit wound very irregular, pushed out with protruding muscles, and with marked ecchymosis spreading from the wounds in all directions The intervening channel between the wounds was irregular, deep, tortuous and septic When the bone was struck, great destruction and comminution invariably resulted. In the large majority of cases the wounds had been inflicted several days before embarkation and were extremely septic

The sisters and nurses removed all the dressings, or had them loose ready for inspection The medical officers of their respective wards then saw all cases, and either gave them personal attention or issued instructions as to how the cases should be dealt with This method expedited matters, and we were able to give personal attention to all cases, although they were so short a period in the ship As will be learnt from reading the account of the operations performed on board, the general lines of present-day surgery were adopted in the treatment viz opening up wound freely, cutting away septic tissues as far as possible removal of foreign bodies, irrigation and free drainage

We had no opportunity of dealing with the cases in the earlier stages, but I would advocate a rigid antiseptic treatment—shave and thoroughly clean the parts with ether soap and biniodide of mercury Then dry and apply iodine 2 per cent carefully and freely to the wound which should be free from oozing blood An anæsthetic should be given if treatment is at all prolonged Hydrogen peroxide should also be used as large numbers of anaerobic germs are admittedly present in most of these wounds, and by the use of this aerobic antiseptic, the prevention of the growth of these micro-organisms is not only retarded, but entirely stopped I have read Sir Watson Cheyne's paper on treatment of recent wounds, and if opportunity allows, his method with pure carbolic will be used and tested

Two cases of emphysematous gangrene occurred on board The organisms which give rise to this condition are (1) *B aerogenes capsulatus* (2) *Pseudo œdematis maligni* (3) *B coli*, (4) *B œdematis maligni* These cases were believed to be due to *B aerogenes capsulatus* Cultures were taken but no growth was obtained and further investigation could not unfortunately be carried out These emphysematous producing bacilli are due to contamination with road dust, soil, and manure

Morph hydrochlor gr ¼ with atropin sulph gr $\frac{1}{100}$ was given hypodermically before all operations Injections of morphia were used to abate shock and a solution was kept for use ? min gr ¼ Bovril and other medical comforts were also largely used

When the patients were being disembarked special notice was taken of the more urgent cases At Southampton these urgent cases were sent to Netley by motor ambulances instead of long distances by train At Cherbourg the same precautions were taken I should like here to acknowledge my appreciation of the most excellent transport arrangements for disembarking the wounded at Southampton, on the first occasion by the military, and the second occasion by the naval authorities There was no delay everything was immediate without hurry and worked very smoothly

Emergency Operations performed in the Hospital Ship Plassy on French and Belgian Soldiers during October and November 1914

Cases

(1) R C Belgian —Shrapnel wound right arm causing lacerated wound upper third, with fractured humerus Gangrene of forearm and arm Amputation through the shoulder joint Axillary vessels tied first Flaps left open No sutures used to permit recovery of the infiltrated parts Fomentations to the stump

(2) N L, Belgian —Bullet wound Entrance to the outer side of supra orbital ridge left side Passed through the eye causing laceration Exit on the cheek close to the nasal bone Very septic Enucleation left eye Iodine to skin Boracic dressings

(3) I R Belgian —Shrapnel wound right shoulder with laceration of tissues Compound comminuted fracture surgical neck of humerus Gangrene Amputation through the shoulder joint Vessels tied first Edges of flaps approximated by suture Drainage tube Iodine Gauze dressings

(4) E L, Belgian —Bullet wound left eye Exit on left frontal region Collapse of eye Enucleation Iodine Boracic dressings

(5) J de K Belgian —Shrapnel wound hypogastric region Wound in bladder and adhesions of this viscus to abdominal wall Peritoneal cavity shut off by adhesions Urine very foul and flowing freely through the wound, soaking the dressings Anæsthetic, wound explored

Bladder found to contain pi[illegible] of patient's trousers, which were removed Bladder irrigated [illegible] placed in bladder Intestines seen but not [illegible] had formed No peritonitis Dressings [illegible] All urine voided through drainage tube on to abdominal [illegible]

(6) A S Belgian —Shrapnel [illegible] arm with laceration of tissues Wounds enlarged and [illegible] Drainage tube and packed with iodoform gauze &c

(7) T H Belgian —Bullet [illegible] Entrance left occipital region Exit left parietal region [illegible] signs of compression Head shaved Flap made by [illegible] two wounds of entrance and exit, and dissected down [illegible] fracture at wound of entrance Portions of bone had [illegible] into the brain tissue and were all removed Com[illegible] exit also The bone, between wound of entrance and exit [illegible] away with Hoffmann's forceps and blood clot removed [illegible] saline and loose brain tissue washed away Drainage [illegible] sewn up

(8) M W, Belgian —Shrapnel [illegible] with laceration of the tissues Wounds enlarged and [illegible] Dead tissues cut away Drainage tube Iodoform gauze packing

(9) Unknown Belgian —Bullet wound [illegible] head Entrance left occipital region Exit left frontal [illegible] right arm Pulse becoming [illegible] Tongue pushed to [illegible] Unequal pupils Head shaved Flap made and dissected down [illegible] incision joining the two wounds Comminuted and depressed [illegible] skull at entrance wound and exit [illegible] loose brain substance which was much lacerated [illegible] wound religiously area [illegible] of dura mater which did [illegible] Dura mater opened Large blood clot removed from [illegible] washed away with [illegible] Drainage tube Flaps [illegible] Paralysis [illegible] and patient recovering [illegible]

(10) [illegible] D Belgian —Shrapnel [illegible] [illegible] was applied [illegible] [illegible] much lacerated [illegible] The vessels and the [illegible] cleansed [illegible] tube and packing [illegible] to leave the [illegible] left on [illegible] found [illegible] [illegible] popliteal [illegible]

(11) [illegible] H Belgian —[illegible] of supra-orbital ridge shot [illegible] Much laceration [illegible] of eye Left eye enucleated Drainage [illegible]

(12) T M Belgian —Shrapnel wound of scrotum Right testicle gangrenous [illegible] up Haematoma right thigh, opened and drained

(13) R A Belgian Shrapnel wound left shoulder Much laceration and gangrene of arm Amputation through left shoulder joint Vessels tied first Drainage Flaps sewn up

(14) H O Belgian —Bullet wound left leg Compound comminuted fracture upper one third of tibia with much laceration of tissues Commencing gangrene Stephen Smith's amputation through the left knee joint Drainage

(15) Unknown, Belgian.—Bullet wound of [illegible] parietal, exit left frontal region. Patient could not speak, had right-sided paralysis. Head shaved. Incision connecting two wounds [illegible] and flap dissected downwards. Fissured fracture of skull upwards and downwards. Comminuted fracture at entrance and exit. Pieces removed. Brain much lacerated and washed away with hot saline. [illegible] over the left rolandic area. Dura protruded but did not pulsate. [illegible] motor incised and large blood clot washed away. Drainage. Flap sewn up. Good progress when patient was landed.

(16) Unknown, Belgian.—Bullet wound left parietal region. Had [illegible] Jacksonian epilepsy. Compound comminuted fracture. Wound opened up by flap incision. Comminuted bone removed. Lacerated brain washed away. Blood clot removed. Dura opened and sewn up. Drainage. Flaps sewn up.

(17) Unknown, Belgian.—Bullet wound through right orbit. Exit on cheek. Eye collapsed, chemosis. Right eye enucleated. Boric dressings.

(18) Unknown, Belgian.—Bullet wound causing a compound comminuted fracture of the right humerus at the surgical neck. Commencing gangrene. Amputation through the right shoulder joint. Vessels tied first. Drainage. Flaps sewn up.

(19) A. F., French.—Shrapnel wound compound comminuted fracture lower one third left thigh with deep wound, much laceration and commencing gangrene. Amputation through the upper one third of thigh by a long internal and short external flap. This operation was performed with these flaps, being the only method of obtaining healthy skin. Drainage. Flaps sewn up.

(20) A. C., French.—Shrapnel wound left leg. [illegible] wound middle one third inner side, passed upwards and outwards causing lacerated wound on the outer side. Wounds enlarged, opened up and scraped. Dead tissue cut away. Piece of shrapnel removed, size of two shilling piece, very irregular, to which was attached a piece of soiled flannel evidently from patient's pants. Drainage tube through both wounds. Iodoform gauze packing.

(21) C. P., French.—Bullet wound left knee, with comminuted fracture of patella. Knee joint freely opened, irrigated and drained. The case was very septic and urgent.

(22) M. L., French.—Compound comminuted fracture right tibia from bullet wound. Much laceration of tissues. Commencing gangrene. Amputation lower one third right femur by long anterior and short posterior flaps. Drainage.

(23) E. P., French.—Shrapnel wound left thigh, septic, small wound inner side, large wound on outer side lower third. Good deal of ecchymosis. Both wounds opened up. Scraped. Dead tissue cut away. Piece of shrapnel removed with portion of shirt attached. Shrapnel had caused roughening of the periosteum on the anterior surface, having grazed the bone without fracturing. Drainage tube through both wounds. Packed iodoform gauze.

(24) I. L., French.—Shrapnel wound right buttock, septic, opened up. Shrapnel removed. Scraped. Drainage. Iodoform gauze packing.

(25) A. C., French.—Shrapnel wounds left leg and thigh. Opened up and scraped. Drainage. Iodoform gauze packing, &c.

(26) A. B. French.—Bullet wound right leg, septic, incised, scraped, dead tissue cut away. Drainage. Iodoform gauze packing, &c.

(27) V. C. French.—Bullet wound compound and comminuted fracture right humerus, with commencing gangrene. Spence's operation through the right shoulder joint. Vessels followed down with assistant's hands after disarticulation; flaps cut and vessels ligatured. Flaps sewn up. Drainage.

(28) I. C. French.—Shrapnel wound middle one third right thigh. Compound, comminuted fracture. Parts much lacerated. Wounds opened up. Comminuted bone removed. Pieces of dead tissue cut away with scissors. Iodine. Drainage. Iodoform gauze packing. Long Liston splint.

(29) E. V. French.—Bullet wound of head. Entrance left occipital region near the middle line; exit left parietal. Paralysis right side. Spastic paralysis left side. Head shaved. Curved incision by joining the two wounds, and flap dissected downwards. Comminuted portions of bones removed. Much laceration of brain tissue. Bone nibbled away with Hoffmann's forceps. Dura mater opened, and much blood clot removed. Superior longitudinal sinus had been wounded, which probably caused the left spastic paralysis due to blood clot finding its way into right side of brain. Drainage. Flaps sewn up.

(30) L. G. French.—Shrapnel wound, septic, of right shoulder. Entrance small at apex of acromion process; exit in axilla; very large lacerated and gangrenous wound. Both wounds enlarged and opened up; comminuted acromion removed. Dead and gangrenous tissue cut away in axilla. Large drainage tube passed through both wounds. Packed with iodoform gauze. Arm placed in angular splint.

(31) E. A. French.—Shrapnel wound right knee; comminution of patella. Opened up and drained. Gangrenous and emphysematous thigh. Too far gone for amputation. Free incisions made.

(32) L. T. French.—Bullet wound left foot and leg. Much lacerated. Emphysematous gangrene rapidly spreading up the thigh to upper third. Amputation through the right hip joint. Patient much collapsed. Head kept low, and infused with brandy and saline *per rectum*. He died five hours after operation from shock. Furneaux Jordan's method of amputation was performed. Drainage. Flaps sewn up.

TYPHOID AND ITS PREVENTION

By Fleet Surgeon P. W. BASSETT-SMITH, C.B., R.N.

It was in 1829 that Louis first applied the term typhoid to fever which had previously been known as "slow nervous fever" and *dothienenterite*. This disease was for some time not differentiated from typhus, and the same confusion of the two fevers is nominally continued on the Continent, for the term typhus is still used by some of our French colleagues to designate what we know as typhoid, the former disease being called "epidemic typhus," in contradistinction to typhoid; while to the ordinary man the difficulties are increased by the introduction of the name enteric. Hence frequently in practice the question is asked, "What is the difference between typhoid and enteric?" Most people, however, understand that typhoid is a common cause of much sickness and death, mostly in the autumn months at home, that it is very prevalent everywhere abroad, and that in time of war epidemics are particularly prone to occur. Those who have had friends or relations serving in India, or have recollections of the Boer War, generally thoroughly understand the danger of the disease.

For many years we were brought up to believe that the contagion of the disease was introduced by water and milk, and that general conditions of bad sanitation favoured the spread of the fever. With this knowledge energetic measures were taken by all those responsible for the public health, always resulting in a great reduction of the incidence of the fever; but still there remained many very puzzling epidemics in which no cause could be traced. In India another factor was soon recognized as being a very powerful means of distributing the disease, namely, the contamination of food through the agency of flies, and endeavours were made to combat this source of infection by protecting all articles used for food by fly proof coverings. The possibility of flies settling on typhoid excreta, and acting as passive carriers of the typhoid germs, was also brought very prominently forward during the South African War, for where large bodies of troops were constantly infecting places which were frequently again used as standing camps, the soil became badly contaminated, and this with the warmth of the climate and lack of sufficient water supply intensified the danger. But there are other factors which are becoming more and more recognized, and which are able to explain

[illegible] times for which [illegible] could be [illegible] direct contagion [illegible] food [illegible] by a single individual [illegible] at the [illegible] perfect health, or infection from [illegible] [illegible] of typhoid, recognized as such

[illegible] bacteriological investigation of the [illegible] of typhoid has shown that the [illegible] during part of its course at least and that the [illegible] is present in the blood, fæces, urine, and other secre[illegible] and excretions including the sweat milk, and even sputum [illegible] importance, then, of isolation and disinfection of individual [illegible] and scrupulous cleanliness of those attending on them [illegible] therefore very evident. Pathological research has demonstrated that many of the internal organs are highly infected the spleen kidneys mesenteric glands and particularly the gall-bladder When the organism once becomes so to speak acclimatized to the last position the bile remains infected for very long periods, continuously or intermittently discharging active bacilli into the intestinal tract and thus for many years causing the subjects to be a danger of infection to those with whom they associate Again, when the kidneys or urinary tract are affected the condition of "bacilluria or typhouria may become established These cases are known as "carriers" and may be active agents of dissemination of the infecting organism continuously or intermittently It has been shown that from 1 to 3 per cent of convalescents from typhoid are "carriers for a longer or shorter period, and that when the gall bladder is infected the condition is most intractable LEDINGHAM of the Lister Institute London, has shown how by bacteriological examinations it is easy to detect the occurrence of these sources of infection and both in England and abroad there are numerous examples of the frequency with which these "carrier cases have started epidemics In our own Service a very excellent example has lately been brought to light in which a ship had constantly recurring isolated cases No cause could be found in water or food and a "carrier was suspected By a careful examination of the blood for Widal's reaction and by a systematic testing of the stools of those giving a positive reaction, the individual was at last traced investigation proved that this man, who had suffered from typhoid ten years previously, had infected men in every ship in which he had been stationed A man in Portsmouth Dockyard was also known to be a "carrier for many years, but

fortunately, as far as I know, without spreading the disease. As the condition is so persistent, and as it is impossible to keep carriers indefinitely in hospital, it is of the utmost importance that they shall be made to thoroughly understand, by often repeated and patient explanations, the danger they are to others, and the necessity for absolute cleanliness with a view to avoidance of infecting food. The known cases are, however, relatively few, and every late convalescent from typhoid should therefore be bacteriologically examined before discharge from hospital, and even then looked upon as a potential source of infection.

In all standing camps, and with troops at war, when in the unfortunate circumstances which must produce fæcal infection of the soil, and where sanitation, as carried out in happier circumstances, cannot be enforced, it is imperative that some other method of protection shall be used. This we have in the prophylactic inoculation of all or as many as possible of those who have to run this risk. Already much has been written, and pamphlets have been freely disseminated by the Research Defence Society and other kindred associations containing abundant statistics which show the frightful prevalence and mortality of typhoid during war, this disease causing a higher death rate in all modern wars than the enemy. Whether such statistics will be repeated in the present conflict of nations time alone will prove, but the serious outbreak in Belgium which has recently been reported emphasizes the danger that awaits all who may be engaged in the land campaign. It is unnecessary to give the history of the protective inoculation method now practised, but it is well known that in England, at least, it owes its origin to Sir A. Wright, and the persistency with which he and Sir W. Leishman have gradually brought the procedure into almost popular recognition.

The rationale may be shortly stated thus: Every antigen (or infecting organism) calls forth the production of protective substances in the blood, which are known as antibodies. In the case of typhoid, if the living organism gains entrance to the body it multiplies and causes the disease, but in time sufficient antibodies are produced (in favourable cases) to bring about a cure, although the protective bodies are produced too slowly to prevent the development of the fever. If a healthy person is inoculated with a vaccine prepared from the dead bodies of the germ and their products the antibody is produced, and is able to bring about the destruction of any living typhoid germs which may be accidentally ingested; thus after inoculation the organisms being dead do not multiply, but they do cause the antibody to be elaborated for use, and the

[illegible] an immunity which may continue for eighteen months or two years. The present war will be a very crucial test of its value.

The vaccine as used in England is one prepared from a strain which is not very toxic. It is sterilized by heating at 53° C. for one hour (previously to Sir W. Leishman's valuable investigation, it was often overheated and its value more or less lost), standardized, treated with 0·25 per cent. lysol, and bottled for use or put up in capsules. Two injections are required: one of 500 million, and one, eight to ten days after, of 1,000 million. Several precautions are necessary, and if these are carried out the percentage of unpleasant reactions is very small. The patient should be healthy at the time; he must not take alcohol for twenty-four hours before or after the inoculation; and the operation ought to be followed by at least twenty-four hours' rest. It is, I believe, best to inject the vaccine into the subcutaneous tissue of the pectoral region after having thoroughly sterilized the skin with tincture of iodine. The injection should be given not earlier than 4 p.m. The patient should then return home, have a light dinner, and go to bed. In the case of ordinary troops they should be allowed forty-eight hours' stand off after inoculation.

Generally an erythematous condition or flushing round the site of puncture quickly appears, and a feeling of soreness or sensation like that of a bruise may be complained of for twenty-four to forty-eight hours; occasionally a stiffness of arm or neck may follow. General symptoms may consist of faintness, lassitude, slight headache, or very mild pyrexia; by the following morning the patient may feel quite well, but should remain quiet for the day. For statistical purposes it is advantageous to employ a single vaccine, either that prepared at St. Mary's Hospital under Sir A. Wright, or that of Sir W. Leishman; the strain of organism is known, the method of preparation is above suspicion, and the results can be compared.

It is stated by Sir W. Leishman that typhoid, which used to cause 300 to 600 deaths per year, was last year only responsible for twenty cases in the British Army, and that this was due to the general recognition of the value of the inoculation, since practically all men come forward willingly for the treatment. In the report of the Anti-typhoid Committee, a most careful inquiry about 19,314 soldiers, whose average period of service abroad was twenty months, gave the following results: 10,378 were inoculated, and these had a case incidence of 5·39 per 1,000; 8,936 were not inoculated, and the case incidence among them was 30·4. In America prophylactic treatment was voluntary from 1909 to 1911, but at the

latter date it was made compulsory In that army the following figures given in Sir W Osler's late paper attest to the great value of the inoculations

		Whole army		Among vaccinated	
	Mean strength	Cases	Deaths	Cases	Deaths
1907	62,523	237	19		
1908	74,692	239	24		
1909	84 077	282	22	1	0
1910	81 434	198	14	7	0
1911	82 800	70	9	11	0
1912	88 400	27	4	9	0
1913	90 645	3	0	1	0

This shows that apart from vaccination there has been an enormous reduction of cases, but the great value of the prophylactic treatment is very apparent

In France the results are equally satisfactory Dopter in the French reports for 1913 notes that several forms of vaccine are being used all giving excellent results —

(1) Heated vaccines of CHANTEMESSE are used in most cases for the military troops and for all the marine He gives the following interesting table of results.

	Force	Cases per 1,000	Deaths per 1,000
In Algeria and Tunis—			
Vaccinated	1 699	0	0
Non vaccinated	19 504	14 16	2 16
In Morocco—			
Vaccinated	239	0	0
Non vaccinated	6 295	16 84	21 13
In France—			
Vaccinated	706	0	0
Non vaccinated	35 054	1 25	0
In the Marine—			
Vaccinated	4,698	0	0
Non vaccinated	66,254	8 7	0 6

In the civil population the results following vaccination have also been very satisfactory, often stopping epidemics in their evolution

(2) With VINCENT'S polyvalent bacillary vaccine the results have been most convincing In an epidemic at Montauban (1913) which attacked both civil and military there were fifty eight cases and sixteen deaths registered per week Three thousand soldiers who arrived in this infected centre both old and young protected by inoculation, remained immune, but the disease continued in the civil population In a gravely infected area in Morocco when the

incidence among the non-inoculated was 169 per 1 000 none among the inoculated troops contracted the disease A law has now been passed in France making inoculation compulsory at the discretion of the medical officer

(3) BESREDKA, who employs a living sensitized vaccine found in a well conducted experiment on certain regiments complete immunity among those treated with his preparation, almost complete immunity amongst those treated with heated vaccine and a high incidence of typhoid among the non inoculated This method of using living vaccines is unlikely to be employed in our own forces though BESREDKA found in cases so treated no examples of living organisms in the fæces of those that were examined Still there is a possible danger, and in view of the good results obtained with killed vaccines, there is no great object in incurring the risks attendant on the use of living vaccines

The great advantage of protective inoculation, of whatever kind is therefore evident but with such a powerful agent for good there must be occasional unpleasant or serious results these are possibly due to particular idiosyncrasies of the patients, want of care in administration contaminated vaccines, abuse of alcohol or want of necessary care after the inoculation Of the many thousands who have lately been treated instances of unfortunate results are very rare These are moderate fever, jaundice articular pains, syncope, septic abscesses, pneumonia, and very rarely cases have been noted of the development of an attack of true typhoid occurring after the second injection In these last there is always the probability that the inoculations were given during the incubation period Such cases, of course, in the popular mind are certain to be put down to the inoculation and are distinctly unfortunate The patient himself is not likely to be rendered any worse by the inoculations for as a therapeutic agent, these vaccines have been used at times with marked benefit even in large doses We have however not sufficient experience yet to say which is the best kind of vaccine to be employed or in what dose it should be given

Occasionally questions are asked If the second dose has been delayed beyond the ten day interval is it safe to give another and after how long an interval? We may reassure the inquirer by saying that there is practically no danger but that after a long interval of one to two months it is probably wise to commence again with a small dose and give the full 1 000 million or third dose after ten days being guided by the agglutination reaction as an index of the immunity conferred

THE FLYING SERVICE FROM A MEDICAL POINT OF VIEW[1]

[illegible] HARDY V. WELLS [illegible]

Great advances have been made both in the skill of [illegible] and in the [illegible] during the past twelve [illegible]. The speed of aeroplanes has greatly increased chiefly [illegible] of engine power but partly also due to the design. [illegible] that the aeroplane of to-day is a much safer machine [illegible] of twelve months ago. Faulty designs have been [illegible] eliminated and the aeroplane much strengthened. [illegible] many of the aeroplane accidents were caused by the [illegible] of some portion usually the wings and chiefly in monoplanes. [illegible] seems to be a quite rare occurrence now, the accidents that [illegible] occur being as far as can be gathered from inquiry, due either [illegible] air conditions placing the aeroplane out of control or to some [illegible] on the part of the pilot. Both these causes apparently will [illegible] tinue but the increased speed now available counteracts the [illegible] of control from the former cause. Errors on the part of the pilot will probably be further guarded against to a certain extent by reliable instruments which will show the flying state of the aeroplane and so avoid a dangerous condition.

High-velocity Accidents.—With the increased speed of aeroplanes now in many machines up to seventy miles per hour the crushing effect on striking earth nose first will be very great and will demolish a great part of the aeroplane even from a very little height. Cases occur where the pilot has not been crushed but has been seriously injured by apparently hitting a part of the machine due to the forward velocity of his body when the aeroplane strikes on its nose and suddenly stops. These incidents occur only in aeroplanes that have the engine in front and the pilot well behind (such as all modern tractor biplanes and monoplanes). The engine takes the shock and the portion of the aeroplane directly behind the engine (where the passenger seat usually is) crumples up while the pilot's seat, &c. which is behind, may suffer comparatively little damage. It is usually the pilot's head

[1] This article was written in 1914 when Staff Surgeon H. V. Wells was in medical charge at Eastchurch Flying School. He is now serving in France.—[Ed.]

that suffers. His body apparently comes to a sudden stop owing either to a safety belt or a hand outstretched, while the head bends forcibly forward on the neck. The result is usually that the head strikes some portion of the machine and is injured, or the neck is forcibly wrenched. No such injury has actually occurred at the Royal Naval Flying School, but an accident of this description did happen: the pilot at the moment of starting put his hand out in front of him against a wooden wind screen which broke, and his hand and arm went through it. His head went violently forward, just failing to hit the screen in front, and he suffered from some pain and stiffness in the neck for a day or two afterwards. He was wearing a belt. The injuries sustained in such accidents seem to be chiefly injuries of the skull due to actually striking, but in one case the only injury found was a fracture or dislocation of the neck. In the case which happened at Brooklands, when an officer was killed in the accident to the Martinsyde monoplane, the pilot, although wearing a belt, was shot almost out of the belt and received head injuries by striking some portion of the machine in front. This was the only injury. It has been suggested that in this accident the head injuries were due to the chin striking first. Here is a possible solution of this and similar cases, but I venture to think that owing to the head being inclined forward the forehead or vertex sustains the striking blow. There are two ways to avoid this: one is a safety belt having shoulder straps to keep the body from being propelled upwards and forwards. This would be unpopular with pilots and would give trouble in releasing before landing. A second and better solution would be to have some giving material in the position in front of the pilot where the head would strike. This could not be a raised cushion or pad, as it would obstruct view and would increase head resistance, a thing the makers would not favour. The giving material would have to be on a level with the existing structure. I have examined a number of various types of tractor machines, and I think the scheme could be carried out in most machines. If, as it seems possible, serious injuries to the neck may occur through a forcible bending forward only of the head on the neck, shoulder straps appear to be the sole solution.

Safety Belts in Aeroplanes.—The question of safety belts in aeroplanes, e.g. some means of strapping the pilot in his seat, has been much discussed in the last year. Most pilots are in favour of such and do wear belts, but a few are averse to them. I have heard several well-known and experienced pilots in discussing the

use of belts, say that they object to them, because if the machine crashes to earth suddenly the pilot may be crushed in his seat when the machine turns over, whereas if he has no belt, and the aeroplane turns over on the ground the worst that can happen is that he is thrown out. Also, if strapped in he probably could not clear himself if the aeroplane caught fire after a smash, and quick releasing devices do not always act. The question of belts I have considered carefully, and have come to the conclusion that a safety belt is a very necessary thing for the following reasons:—

At times, in flying, air conditions are met with which may unseat the pilot. Unseating may not throw him out, but it will cause him to lose hold of his controls for the time being, which in itself is a serious danger. This frequently happens while flying in strong gusty winds, and also occurs on calm days when an aeroplane comes suddenly from a calm to a disturbed local condition. The pilot is then caught unawares; his feet, which are resting against the steering bar, easily come off that, and thus rudder direction is lost. Moreover he may be thrown forward on the elevator control, and pushing this forward suddenly may cause a dangerously steep dive. I witnessed at the flying ground, last summer, an accident by which a pilot was nearly thrown out. A naval officer pilot, while descending from about 500 ft. in an ordinary volplane glide, got into a disturbed air "patch," and was thrown bodily forward. His foot coming off the rudder, he was thrown against the control, which was pushed forward, and so the machine was placed at a dangerous diving angle. Only by holding on to the wheel control was he saved from being thrown right out, and when the machine was about 70 ft. up it luckily recovered itself before the pilot had time to get back to his seat and regain control. I went to the aeroplane after it landed, and the pilot said he was not using a belt, but was only kept from being thrown out by holding tightly to the wheel control.

Of course it is well known that the disturbed air conditions due to rising air currents and gusts exist chiefly close to the ground—at all events, not above 1,500 ft. to 2,000 ft. Above that the air conditions are more steady; therefore it is the atmospheric disturbances met with in the lower area through which an aeroplane must ascend or, more important, descend, that require to be guarded against.

Now against the safety belt is the danger that when the occupants of an aeroplane are strapped in they will in all probability be crushed should the machine roll over on touching ground at a

bad landing, or landing on bad ground. I know of several cases where, if the occupants had been strapped in, they most certainly would have been crushed owing to the capsizing of the machine. In the case of an accident at Queenborough the aeroplane turned over and over and was completely demolished. The occupants, although seriously hurt by being thrown out, were saved death.

There is a good deal to be said on both sides of this question, but the objection to belts can, I think, be easily overcome by devising a release which can be readily used just before a landing is made. The present type, where the release pin is on the belt and releases the belt from the body, is not reliable or easy to manipulate when the pilot is busy, his attention being taken up with working controls, engine, &c., for landing. A lever on the side of the machine by the pilot's side, which releases the belt from its attachment to the seat, is, I think, a more suitable, more convenient, and quicker arrangement. The belt must be fairly broad and comfortable, and have elastic or such other means for giving springiness. Its attachment to the aeroplane must be very carefully adjusted so that all freeing devices can clear. A case happened recently when an aeroplane capsized on a forced landing just outside the flying ground: the pilot was found unhurt, but suspended face down, owing to the quick-release device failing, the buckles of which were not able to clear owing to being fitted faultily in the aeroplane.

Safety Helmets.—Whether these should be worn or not is also a matter for discussion amongst aeroplane pilots. The objections put forward against helmets are that they are uncomfortable, and would not save the head from a fall except from the smallest of heights. If one falls on any other part of the helmet but the actual top of the crown, the additional height of the crown would force the head backward or forward and so break the neck. Also, if wearing one in a tractor machine the added propeller draught beating on a high-crowned helmet forces the head back in a most uncomfortable manner. In favour of helmets it can be stated that they are quite comfortable if a proper size is used; that in a ground smash they protect the head from a blow of broken spars; that if the pilot is thrown out, and his head hits a wire, they save a scalp wound; and that the earflaps save damage to the ears. Moreover, if he is thrown on to the ground, the helmet would save injury to the scalp, and possibly a fracture of the vertex or the base of the skull. All the above would be, of course, in the case of an aeroplane smashed on actually landing. Everything seems to favour helmets

being worn. [illegible] and in the modern [illegible] the pilot [illegible] a good deal from the propeller draught. A [illegible] headgear [illegible] pilots just now is a leather skull cap with ear protection pads such as is worn by the racing motorist. The ideal helmet, no doubt, would be one that took its support from the shoulders but it would be rather cumbersome and would encase the wearer and so be rather unpopular. The question of what type of helmet is most suitable is now under consideration.

Clothing.—As a protection from cold lined leather jackets are generally worn with, in cold weather, a "sweater" (woollen) underneath. The Admiralty now issue a leather lined coat and trousers—these are light and serviceable. The hands are shielded by lined leather gauntlet gloves. Aeroplaning, even in cold weather, seems to cause very few chills on the abdomen or chest, probably because pilots take the precaution of being adequately clothed. The only cases of chills can usually be traced to inadequate protection. Modern aeroplanes with their protecting screens are more comfortable for the pilot.

Physical Requirements of Candidates for the Flying Service.—The candidate must be physically fit and I would reject the [illegible] type. Particular attention must be paid to eyesight. Full normal vision and colour vision is required. Hearing must be good. The teeth ought to be in good condition. Weight does not matter.

Age.—It is not possible at present to lay down any hard and fast rule as to age. My opinion is that the age for selection is between 20 and 30 years. Over the age of 30 is, I think, too old to begin to learn flying with a view to being a Service pilot, e.g., to take up a flying officer and fly under all conditions.

Type.—This I have studied carefully, but have come to no conclusion. The active type, the man who is keen on such things as motoring, motor bicycling, riding, hunting, the exciting sports with an element of danger, seem to make the best pilots.

Sight.—Full normal vision is important for all aeroplane pilots and all candidates should be carefully examined for vision. This full vision is important for landing an aeroplane, because the machine diving towards earth at an angle, is then turned up or what is called "flattened out" at the right moment for landing. This right moment is at a certain distance from earth which the pilot must gauge. If he turns up too soon, the aeroplane drops from a height and probably smashes; if he turns up too late he dives into the earth and wrecks the machine. The accidents on

landing, is, in the majority of instances, probably due to [illegible] judgment on the part of the pilot, but that error, I think, in some cases is due to defective vision, although so far there is no proof of this. Two well known private aeroplane pilots have defective vision corrected by glasses. This seems to serve them well, especially as they can have their glasses fitted as goggles instead of wearing the usual plain glass goggles; but there is always the possibility of the glasses or goggles getting shifted or covered with oil (in the engine-in-front type of aeroplane). This does not affect the normal vision pilot who pushes the goggles up or down out of the way. Good vision is also needed in looking for a suitable field for landing when a forced landing has to be made due to engine trouble or other defect.

Hearing.—This must be good, as any engine defect in the air gives first indication by sound. Failure to instantly detect, by hearing, any engine defect may lead to serious accident while flying.

Effects of Aeroplane Flying on the Pilot.—During the previous year an attempt was made to find out if the pulse-rate and blood pressure were affected. This was continued during the early part of 1913, but the results were most unsatisfactory from a research point of view. In some cases the pulse-rate showed an increase after only a short flight in calm weather, while in others the rate remained normal. After a flight in bad weather conditions the pulse-rate was always increased. This was to be expected, because to keep the machine on a level means an expenditure of muscular energy. In the case of passengers the pulse-rate showed very little difference, except, of course, those passengers who were making their first flights and suffered a little from nervous excitement. Nearly all the cigarette smokers seem to have an increase of pulse-rate, and as a great number of aviators are cigarette smokers, one can expect some increase in pulse rate after flying. As regards blood pressure, the only way to get any definite results seems to be to send the subject up in the air with a recording blood pressure apparatus, but unfortunately the vibrations of the machine, due to the engine, affect all pressure recording instruments, and the results are very doubtful. I think as machines improve it may be possible to carry out such experiments, and obtain some definite data.

Editorial.

It may be of interest if here in the first quarterly number a brief outline is given of the origin and scope of THE JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE and a few observations as to its subsidiary policy.

Of late years the publication of a professional Journal has been widely discussed, and a majority of officers has felt that if originated, such a Journal would meet with success and would obtain the support of the Medical Service in general. Sir James Porter, K.C.B., late Director General, was strongly of this opinion, and to him falls the credit of the original recommendation on this subject. Then, during the past year Sir Arthur W. May, K.C.B., Director General, initiated and submitted a scheme for the establishment of the Journal, which was at once approved by the Board of Admiralty. Various preliminary details had already been settled towards the end of July, 1914, and some progress had been made in collecting material for the first quarterly number, but the outbreak of War which entailed a great increase of work at the Medical Department, necessitated a postponement. However, in view of the high importance of such a publication to the Service at present, it was decided on the 16th November to resume preparations, and to issue the Journal in January 1915. At that time departmental work in connection with the War was still at high pressure, and even now is little if at all reduced. We ask our readers, therefore, to make allowances for such deficiencies as may appear, though at the same time helpful criticism is invited. It may be mentioned that it is intended in the future to increase the scope and character of the Journal as far as finance permits.

It is well known amongst medical officers that much of the scientific and medical material in their official reports and other papers, some of which deserved wide publication, has been unavoidably wasted in former times. It was the custom to publish annually in the Appendix of the Health of the Navy, a few only of those original communications which were of most interest to the Service, but now that our Journal is available many of the articles hitherto relegated to obscurity will have the publicity and recognition to which they are entitled. It is hoped that contributions will be received from all ranks of the Service, junior as well as senior

It is [illegible] time to time, and to include [illegible] notes, fuller Service news and correspondence. Under the last heading, space might be found for queries as to the course of treatment to be adopted in particular circumstances as well as discussion under pseudonyms. In general, however, the Journal will be conducted on the lines of the present issue.

With regard to the management, we may quote the terms of the recent circular letter from the Director General—"Adequate support is absolutely essential to success. It is confidently expected that such support will be forthcoming, and that all will unite in the endeavour to promote a publication worthy of the Royal Navy." It is obvious that if the Journal continues to receive literary as well as financial support, its success is assured.

The Naval Medical Supplemental Fund

The subsidiary policy will be to foster by every means such associations as The Royal Navy Medical Club and the Naval Medical Supplemental Fund.

It is possible that some medical officers may still be unaware of the history and objects of this Fund. Founded in 1817, it is administered for the benefit of orphans of deceased subscribers by a Court of Directors the President of which is the Secretary to the Admiralty. Subscription was compulsory for all medical officers up to the year 1862 but since then few have joined, and the benefits are practically confined to orphans of members who entered the Service prior to 1861, now a small and diminishing number. In January, 1915, it was proposed to affiliate the Fund to the Royal Navy Medical Club, which body was prepared to undertake its administration with provisos that the Fund be distinct from the Club, the subscription be reduced to 21s. per annum if possible and that the benefits be extended to the widows of all subscribers. The Court of Directors was approached, and was in favour of this arrangement. Progress towards transference of the Fund has now reached the stage of Parliament; repeal of the original Act being necessary. When this materialises, the Fund, now about £10,600 in Consols, should form the basis of a sound and popular insurance scheme.

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Clinical and Practical Notes.

NOTE ON A TYPHOID CARRIER

By Surgeon SHELDON F. DUDLEY, R.N.

Between April 1911 and March, 1914 H.M.S. "Formidable," then serving in the Home Fleet returned twenty nine cases of enteric fever, at a time when other ships were remarkably free from the disease. These cases occurred singly and at irregular intervals. They arose indiscriminately in several different parts of the ship, and at various ports. The drainage water and food supply were, after an exhaustive investigation found to be above suspicion. Ships serving under identically the same conditions returned clean sheets as regards enteric fever. Practically the only other possible cause of the epidemic in the "Formidable" was the presence of a carrier in the ship. She was free from enteric before April, 1911, therefore this carrier must have served in her after that date, or, assuming the earlier cases to have had some other origin, the carrier might have been one of the original cases of typhoid who had returned cured to the ship.

These facts reduced the search to those who were serving in the vessel before April, 1911, and to those who had had enteric fever whilst serving in her, about fifty men in all. The blood of each of these men was tested for agglutination against *Bacillus typhosus* and their urine and fæces were bacteriologically examined for *B. typhosus*. No *B. typhosus* was isolated from any of their excreta at the first investigation but one man gave a marked positive Widal reaction. He was re-examined three times, and it was only on the third re-examination that *B. typhosus* was isolated from his fæces.

This case had the following history. During October 1898 he was sent to the Royal Naval Hospital, Chatham, suffering from enteric fever. In 1892 he had dysentery in China, but no other illness since then. He is a strongly built big man, 39 years old. He has no signs or symptoms of gall bladder disease or any other trouble. His rating in the Navy was ship's cooper, and his work, therefore, brought him in contact with articles of food when opening casks and cases to assist the ship's steward in serving out these rations to the crew. In the table below is a list of ships in which he served, the date on which he joined each, and the cases of enteric fever (diagnosed definitely as such) that occurred. This list is compiled from an examination of the medical journals of the ships. Fatal cases (when the result is mentioned in the journal) have also been noted in the table. The cases were, of course, distributed amongst many hospitals all over the world, hence this table is probably very incomplete in regard to deaths, and it is more than likely also that the actual number of enterics is underestimated, cases of enteric fever may have been missed amongst such entries as simple continued fever and pyrexia.

With regard to the twelve cases returned by the "Pembroke" during the time this carrier was in the naval barracks, two are noted as occurring actually in the barracks, and no history of the infection could be obtained

[illegible] however were [illegible] I have [illegible] [illegible] or leave. All the other cases since 1902 occurred at [illegible] the rest of the Fleet was remarkably free from this disease, [illegible] infection could be discovered

[illegible]	Date [illegible]	Place where serving	Cases of typhoid	Noted in ships journal as having died
[illegible]	June 15 1898	Home	—	
Orlando	Feb 15 1899	China	2	
Pembroke	July [illegible] 1902	Home	5 (12)	—
Immortalité	Aug 27 1903		1	1
Endymion	Jan 18 1905		1	1
Albion	May 8 1906	Channel	1	—
Majestic	Feb 6 1907	Home	2	—
Venerable	Jan 7 1908	Channel	4	—
Implacable	Feb 2 1909	Atlantic	6	—
Pembroke	April 1 1910	Home	2	—
Cæsar	June 7 1910	„	1	
Formidable	April 1 1911	„	28	7
			53	11

The four cases of enteric fever in the "Venerable" in 1908 appeared on the following dates (1) January 9 1908 (2) January 31 1908, (3) July 23, 1908 (4) December 14 1908

The medical officer of this ship writing at the time, notes that Case (3) had not been ashore for one month, and that Case (4) had not been on leave for two months Six cases were reported from the "Implacable" in 1909 when there were two cases only of enteric fever in the rest of the Atlantic Fleet, whose average strength for that year was 9,020 men In his journal for 1909 the Fleet Surgeon of the "Implacable" wrote "I have tried to trace how these men got the disease but failed It is quite possible there may be a carrier in this ship as some cases occurred in the 'Venerable' from which this ship's company came I have gone through the medical history sheets and find there are four men who have had the disease in the last three years When the ship arrives at a port where there is a laboratory I will have them examined" Unfortunately the responsible carrier had had the disease eleven years ago and if all the men with a history of enteric fever had been then examined this man might have been discovered five years earlier The strain of bacillus, with which this carrier is infected, seems a fairly virulent type as eleven deaths are noted out of the fifty three cases he was probably responsible for The last case in the "Formidable" epidemic developed enteric on March 12, 1914

The following observations were made on the carrier while in hospital The urine was always sterile Blood cultures were negative The Widal reaction was positive Up to a 1 150 dilution it varied very

slightly in strength The appearance of typhoid bacilli in the stools was intermittent three of four negative examinations being followed by two or three positive results

The technique used was as follows An emulsion of fæces in normal saline was lightly centrifugalized, and allowed to stand for twelve hours in the incubator The upper layers of the fluid were plated out on Conradi's, Drigalski's, Fawcus's brilliant green and Endo's media, and suspicious colonies proved by sugar reactions and agglutination tests There seems to be no difference in the efficiency of these media, all giving identically the same positive and negative results

In seventeen examinations of the fæces at about three days' intervals *B typhosus* was isolated seven times

The last point to be noted is the disposal of the patient From the naval point of view, he was not a safe man to have in any ship, where any number up to 900 men live under cramped conditions. The only possible course was to invalid him out of the Service after explaining to him as carefully as possible the danger he was to others, the necessity to avoid the handling of other people's food, the advisability of disinfecting his hands after defæcation and, if possible, the disinfection of his excreta The medical officer of health of his district was informed of his address with a view to keeping him under observation as a possible cause of enteric fever in his district A course of treatment, with a vaccine and prolonged observations would have been tried but unfortunately, the man lived too far away to render it possible

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NOTES ON THE USE OF EMETINE

By Surgeon-General DONALD J HOSKYN M B R N

Royal Naval Hospital Hong Kong

THE subcutaneous injections of the salts of emetine will probably in time altogether supersede the administration of ipecacuanha in the treatment of cases of amœbic dysentery

An extended experience of this drug, given subcutaneously or intramuscularly, shows that it does not lead to vomiting or depression and so far it has proved non-injurious and has always had a rapid action on the amœbæ

The following cases illustrate its efficacy —

(1) C R, aged 28 was admitted to hospital on 13th September 1913 having suffered from diarrhœa since 1st September On admission his temperature was 99 2° F tongue was furred and the stools of which he passed eight to twelve in twenty-four hours, contained a quantity of blood and a little mucus He was put on milk diet and given an astringent mixture emetine hydrochlor ½ gr being injected subcutaneously morning and evening Under this treatment he improved

On the 22nd only one stool which was normal in character was passed and the temperature, which had ranged from 99° to 100 6 F was 97° F The emetine and mixture were then stopped Syr Easton 1 dr was ordered three daily, the diet being altered to "low" with two eggs On the 29th the patient had a relapse, the temperature rising to 102° 1

... blood and mucus accompanied by much ... The diet was again changed to 'milk' and emetine ... ... as before The relapse continued with decreasing ... for five days The diet was increased to 'low' on the 4th and to 'full' on 16th October The patient was discharged cured on 7th November

(3) A P, aged 26 who was taken ill at Canton, on 21st March 1914, with profuse diarrhœa accompanied by tenesmus, was admitted to hospital three days later The stools contained blood and mucus, while numerous active amœbæ were seen in every microscope slide examined The temperature varied from 98 8° to 99 6° F five stools were passed during the patient's first night in hospital 'Low' diet was ordered and 1 gr of emetine was injected subcutaneously every morning Under this treatment the stools decreased to three on the 25th, and one on the 26th The temperature was normal on the following day, after which no more emetine was administered 'Full' diet was ordered on the 30th the patient being discharged cured on 4th April 1914

Altogether six cases have been treated by this method In two, the dose administered was ½ gr morning and evening These received twelve and twenty one doses respectively and required twenty six and fifty five days in hospital—an average of 16 5 doses and 40 5 days under treatment

The other four cases received 1 gr once daily They required from four to seven doses only—an average of 5 2 and were under treatment in hospital from eleven to twenty one days—an average of fifteen days One of these had suffered for twenty one days before admission to hospital He received five 1 gr doses of emetine, and was in hospital for only thirteen days These cases seem to show that the larger doses save much time in treatment

The action of emetine does not seem to be restricted to cases which are dysenteric in character, for besides its specific action on the amœbæ of dysentery, it seems to have a remarkably tonic effect on the mucous membrane of the intestine Owing to the success of the drug in dysentery, we have lately used it in treating recent cases of simple colitis with great success In two cases of colitis with severe diarrhœa, in which amœbæ were not present in the stools, only one injection of emetine was required in each instance to effect a cure, no other medicinal treatment being adopted It is probable that in the future the range of usefulness of this drug will be still further extended in treating diseases of the intestines.

The employment of emetine in treating diseases of the liver is illustrated by the following case —

J B, aged 28 had a previous history of (1) Disease of the liver in 1910 for which he was on the sick list ten days, and (2) "Pyrexia" from 8th October to 5th November, 1913 For sixteen days of the latter period there was a slight rise in temperature (99° to 101 2° F) During the first part of the illness he passed fluid stools, and it was thought that he had enteric fever, but Widal's reaction was negative He recovered completely without an exact diagnosis being made He was now admitted to hospital on 18th February, 1914, with a history of progressive weakness frequent headaches, loss of appetite, occasional nausea and constipation For some days before admission to hospital he complained of pain in the right side below the costal margin On

examination the [illegible] on percussion to be enlarged [illegible] fourth rib in the mid axillary line [illegible] crepitation [illegible] the right base posteriorly

The leucocyte count was 16,[illegible] and the temperature [illegible] 99 2° F on admission, rose to 101 [illegible] p m Taking [illegible] the previous illness in 1913 which was possibly due to a mild attack of dysentery, it was thought that the symptoms from which he suffered pointed to an abscess in the liver Therefore it was proposed to confirm this by the insertion of an aspirating needle It is a matter of regret that this was not done but on the other hand had pus been discovered the abscess would have been opened and drained

While discussing the case Surgeon Mervyn Browne suggested that the subcutaneous injections of emetine might be tried Aspiration was therefore postponed, and 1 gr was injected on three successive days with a result that exceeded all expectations

The temperature fell to normal on the fifth day, the leucocyte count was 10 132 on the sixth and 8 437 on the eighth day The physical signs completely disappeared and the patient was discharged to duty on 12th March since which date he has made no complaint

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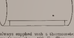
AN IMPROVISED HOT AIR CHAMBER

By Fleet Surgeon J FALCONER HALL M B R N

The following is a short account of the hot air chamber which I had made on board It is really a cylinder made of thick tin open at both ends, and fitted with two electric lamps at the top and a small stool at the bottom If the knee is placed in this chamber both ends of which are then closed and two fifty candle power lamps switched on a temperature of 200° F is obtained rapidly



The patient is always supplied with a thermometer, and told not to allow the temperature to rise above 180 F This can easily be effected by lifting the covering at the ends or switching off one of the lamps In cases of effusion into joints I have found the hot air treatment very efficacious It reduces the effusion and at the same time relieves the pain In one case of gout it acted like a charm and in some cases of rheumatic attacks it has eased the pain at once and helped to reduce the swelling in the joint

The chamber is light and portable and the patient can be treated in bed without disturbing him As a rule I start with half an hour's treatment and increase this to an hour twice daily

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NOTES ON AMBULANCE TRAINS AND DESCRIPTION OF NAVAL TRAIN NO 1

By Surgeon A VAVASOUR ELDER RNVR

The main desiderata of an ambulance train are smoothness of running coupled with the possibility of travelling anywhere on any company's system The former point is gained by the use of long "bogey" coaches, while the latter is obtained by limiting the length of these bogeys The two points are somewhat antagonistic and must be met by compromise Needless to add the train should be on the corridor plan throughout, including the brake vans at each end, so that the guard can be communicated with while the train is in motion

Another important factor is that the train once equipped should be made as independent of outside assistance as possible In other words it should be self supporting by means of adequate supplies of all requisites for a journey—foodstuffs medical comforts dressings water, gas, linen, bedding &c Thus cases can be conveyed to their destination comfortably and quickly On return to the base the stocks are renewed while the train is being cleaned in readiness for another run

The next point for consideration is the method of carrying "cot cases" There are two ways of accomplishing this—the "fixed cot" and the "movable cot" In the former the cot is a permanent fitting of a coach, while in the latter it is movable and can be conveyed in any similar coach on the train

On military trains the cots are fixed, being fitted lengthwise in two tiers on both sides of the coach In the centre is a gangway The lower cot is hinged to the side of the coach and in the centre it has two movable legs The upper cot is on the Pullman sleeping car system and can be tipped up out of the way when not in use

The objections to the fixed cot are as follows —

(1) The cot and patient become a component of the coach and are subjected to its every movement while running

(2) As the cot is fixed in the train the patient has to be brought into the coach on a stretcher and then transferred to the cot On arrival at the destination the process must be reversed Thus the patient is being continually moved about during his journey from the port of arrival to the base hospital

In cases of severe injury this repeated transfer is most prejudicial and not unusually, painful for the patient Some cases do not permit of this continual change and the stretcher has to be taken into the train placed on a cot and travels with the patient to his final destination Under such circumstances the patient does not derive the benefit of the spring mattress with which the cot is fitted, because the whole weight of the stretcher is supported by the ends of the cot frame All jars are transmitted directly to the patient through the fixed cot

In the naval train the cots are slung in two tiers, upper [illegible] on both sides from hooks in the roof of the coach When [illegible] the cots are lashed to the side of the coach [illegible] fender [illegible] between the cot framework and the side of the coach

The advantages of this method are —

(1) The cot is not a component part of the coach Vertical [illegible] is practically absorbed through the suspension, and lateral [illegible] up by the "fender

(2) The cot can be removed from the coach and used as [illegible] for conveying the patient to and from the train Thus there [illegible] intermediate transfer between the place of arrival in England [illegible] and the hospital

Naval cases are dealt with as follows The patient is pl[illegible] a service cot either in his own ship or the hospital ship The cot [illegible] conveyed to the train and suspended in a coach, the train gi[illegible] its own cots completely fitted, in exchange hence there is [illegible] lost in loading the train On arrival at the hospital the same [illegible] is followed the train receiving a clean cot for every one [illegible] hospital The standard equipment of a cot is one mattress one pillow and two blankets

(3) If a case is too serious to be moved from a stretcher [illegible] stretcher and patient can be taken into the train, and suspended [illegible] a cot by means of lanyards

(4) For cleaning purposes the cots are taken out of a coach [illegible] the bare walls, which can then be thoroughly washed down [illegible] themselves are unlaced and scrubbed being disinfected if necessary before replacement

Thus it will be seen that the movable cot system is the most comfortable for the patient in every way The drawbacks to this method are —

(1) The cots once hooked on, must be firmly lashed up against the "fender" at the side of the coach There must be no "play" otherwise considerable lateral jarring is felt and there is also a forward swing when the train starts or stops The officer in charge of the train must pay special attention to this point satisfying himself by personal examination of each cot that the lashings are secure During the run they should be examined as occasionally they work loose Patients should be warned to call the attendant's attention if this happens

(2) If as is usually the case the coach is being loaded at both side doors simultaneously then a definite routine of placing the cots in position must be adopted, to avoid bearer parties interfering with each other

(3) To place a cot in position requires six bearers, four to hold it while the other two one at each end hook it on whereas a case on a stretcher only requires four or five at the station to effect the transfer into an upper berth For lower berths three bearers are sufficient

It will be seen that the movable cot system requires a large working staff At the same time the additional two men act as reliefs when the train crew are called upon to do their own carrying to and from the train if outside help is unobtainable or deficient in quantity

Water.—The water supply—domestic and sanitary—is an important item Very large quantities are called for during a trip Unless

additional tanks have been fitted by the railway authorities these will have to be added before the train is fit for service. A number of field service water bottles distributed throughout the train, serve the double function of increasing the water supply and facilitating its distribution. They can be readily refilled at any wayside station where no facilities for rapidly filling the main storage tanks exist. Tin mugs for use with the bottles should be provided.

Speed of the Train.—From the point of view of the comfort of patients there is no hard and fast speed-limit applicable to ambulance trains. Briefly, where the permanent way is good, fifty five or sixty miles per hour is not too fast, whereas, if the road is bad, twenty miles an hour is an excessive speed. On good roads at high speeds the motion of the train is less perceptible than even at moderate speeds, thirty miles an hour, on an inferior road.

A speed of forty miles per hour has apparently been fixed by the Government authorities. This for average running time may be perfectly satisfactory, but practical experience on the naval train has shown that some of the drivers take the order literally, irrespective of the condition of the road, and much to the discomfort of their passengers.

The drivers, while maintaining an average speed for the whole run, should be permitted to use their own discretion in favourable localities. If this is considered undesirable then it should not be difficult for the railway authorities to plot out speed tables for the various sections of their line, instructing the drivers to adhere strictly to them.

Care of Patients.—The surgical scope of an ambulance train while in motion is very limited. It is, in fact, frankly disappointing. With the exception of emergencies and occasional cases where the site of a lesion is favourable, the experience of seventeen hundred assorted cases has shown that attempts to "dress" patients *en route* invariably cause more actual discomfort, and in some cases acute suffering, than is justified by the fact of the case having been "dressed." Furthermore distances are not so great in this country that a case cannot be left for three or four hours longer than would otherwise obtain.

To be brief, beyond setting a tight bandage or temporarily adjusting a damaged part, and a not too sparing use of morphia where indicated, the whole efforts of the train staff should be concentrated upon making the journey as comfortable and pleasant for the patients as possible under the circumstances.

These efforts may be summed up as consisting of constant attention to details in regard to food and drink, warmth, and obtaining the position of maximum ease for the patients.

Some trains are fitted with an operating theatre. This has yet to justify itself. For use the train must be side tracked, and it is a moot point whether a case possibly requiring operation should either be allowed to travel or whether it should not be landed at the first possible point if operation is called for. No case, however urgent, could conceivably be satisfactorily operated upon while the train was running. It might be attempted, but the circumstances justifying the attempt would be most exceptional and hardly worth considering. It is true that in the event of an invasion of this country the train might serve as a mobile field hospital. Even then the enemy is not likely to allow it to

remain stationary long at any given point to say nothing of the blockage of the line for other purposes

Mental Cases—For the milder and quieter cases no provision beyond a special watch is required, but the noisy and violent types should be segregated for their own safety and the welfare of other patients. In the Naval train two padded cells have been fitted which meet these requirements. A patient placed in the cell can safely be left to his own devices during the journey.

The Naval Ambulance Train No 1 is a unit of the Medical Transport System organized in the Nore Command by Surgeon General Sir James Porter K C B, R N and consists of twelve coaches belonging to the London and North Western Railway. They are on the "corridor" plan throughout including the guard or brake van at each end.

Commencing from the engine the train is made up as follows: A guard's van, one seven compartment corridor coach, two cot coaches, a day coach, three cot coaches, a store coach, a kitchen car with dining saloon, a family saloon, and finally, a guard's van.

The actual coach length of the train is 518 ft, while the total length overall buffer to buffer is 568 ft.

In the front guard's van which is used as accommodation for the train crew, sixteen hammocks can be slung and when not required for patients the adjoining compartment coach is also used by the crew.

The other guard's van is used for patients' baggage and effects. The store coach is technically known as a "brake third" containing five ordinary compartments and a brake van. In the brake portion lockers for bedding and linen clean and soiled have been fitted and also racks for ward utensils. A safe for valuables is also placed in this part. One compartment of this coach is used as a store room for dry stores and groceries, another as an office for administrative purposes, and a third is allotted to the cook and the senior sick berth steward of the train. The remaining two compartments are used as indicated by circumstances, isolation cabins &c.

The Medical Staff—Two medical officers and two nursing sisters are accommodated in the family saloon at the rear of the train. This is divided up into three compartments of which the two end ones are fitted with two facultative sleeping berths each, while the centre one acts as a sitting room when the ordinary dining saloon is occupied by patients.

The train crew is composed of thirty eight members of the St John Ambulance Brigade belonging to the Royal Naval Auxiliary Sick Berth Reserve, and a sick berth steward working under a medical officer Royal Navy. The men are all well versed in the ordinary work of the Brigade and in addition have been specially trained since the war began for service on the train. A cook belonging to the railway company's staff is also carried.

Cot Coaches—The cot coaches are five in number. They are used in peace time for conveyance of parcel mail and are each 45 ft long, 8 ft wide and 7 ft high at the side, rising to 8 ft in the centre by means of a clerestory. At both ends are two sliding half doors giving access to adjoining coaches, while on each side are two sliding doors 4 ft 6 in situated equidistantly from each end, that is there are 12 ft of space between the doors themselves and the end of the coach.

Each coach is steam heated by overhead pipes in the clerestory

[illegible]

[illegible]

portion, a thermometer being used in [illegible] are lighted by gas in incandescent lamps fitted [illegible] A simple device has been fitted in the [illegible] trol ling the gas from inside as the type of [illegible] has only outside control For emergency [illegible] torches is carried

Fig 3.—Lab [illegible]

Each coach contains twenty [illegible] upper and lower The upp [illegible] lets into the roof of the coach wh [illegible] the same hooks by means of a [illegible] end and a hook at the lower (fig. 1) The [illegible] length and are interchangeable They can be [illegible] or for suspending special cot cases in the cent [illegible] the coach, as [illegible] in fig 2

At the side of the coach is a series of "fenders" properly spaced, against which the cots are lashed when travelling They are made of canvas covered pads of tow mounted on wood bases, which are screwed on to the side of the coach as shown in the illustration

In order to relieve the tedium of a long journey for patients, the windows of the coaches are not obscured, privacy is easily obtained by pinning the flap of a cot over the window

Sitting Cases—Ordinary accommodation for sitting cases is provided by a corridor coach containing seven separate compartments each holding six patients comfortably Additional space is provided in one or more cot coaches, if not otherwise occupied, by lowering the cots on to the floor Two cots are placed one above the other on the floor, and a third is utilized to form a back rest being secured by the ordinary cot lashings to the side of the coach The seats are arranged on one side of the coach for half its length and then on the other for the rest Thus one doorway is left free on each side, and an uninterrupted gangway is obtained throughout the whole length of the coach (*vide* fig 3) The patients have ample room to stretch their legs or walk about without interfering with others The lanyards for the lower cots are hooked together, forming a "life line" to facilitate walking along the coach In this way thirty six to forty sitting patients can be carried comfortably in each coach

Emergency accommodation for short journeys is provided by means of folding seats in the brake vans at each end of the train A van, if un occupied by baggage, will seat twenty four

Day Coach—The utility and comfort of the train are greatly enhanced by the inclusion of what may be termed the "day coach" in its com position It is an ordinary parcel van similar to those used for cot cases At one end two w c s have been fitted one on either side at the other end, on one side, there are two padded rooms 6 ft by 3 ft by 7 ft for the safe carriage of violent or noisy mental cases Opposite to these is a small "dressing station" fitted with table lockers, sink and sanitary bin This can be screened off by means of a curtain drawn across the coach and here ambulant cases can have their dressings renewed in comfort and privacy

On each side of the central portion of the coach and at suitable intervals apart eight wash basins fitted with water supply have been installed When not in use the basins are covered with a flap hinged to the side of the coach This acts as a table for serving meals or other purposes Sitting accommodation is provided by collapsible forms Twenty eight patients can sit down to a meal at a time This coach has proved a great comfort to men on long journeys (*vide* fig 4)

Food is brought to the coach from the galley by means of specially designed carriers They are wooden boxes fitted with shelves for carrying six plates at a time one above the other The shelves are all movable for cleaning purposes and the upper portion of the carrier is divided into two compartments by means of the handle In these compartments the cutlery and cruets are carried to and from the coach

The coach is situated almost centrally in the train so that the distance from the kitchen is not so great It also serves to divide the "sitting cases" from the cot coaches ensuring quiet and freedom from tobacco fumes

Officers Accommodation—One coach No 5, is specially reserved for

cot cases among all cars If circums[illegible] permit the cot [illegible] in the centre of the coach suspended by four lanyards one at each corner as shown in the illustration (fig 2) The cot can either swing freely or be lashed down to the sides of the coach according to indications, the former being a very comfortable method of travelling Washable canvas screens are fitted to all the doors and individual cots can be screened off if desired Otherwise the coach is fitted similarly to the rest

Sitting-up accommodation for ten officers is provided in the dining saloon If necessary sleeping accommodation for eight is obtained by cots specially made to fit across the seats of the dining saloon Individual privacy is given by fore and aft canvas curtains on both sides of the centre gangway as in a Pullman sleeping car

[illegible]

C[illegible] [illegible] mum is 1[illegible]0 cots and 7[illegible] such as the d[illegible] coach, [illegible] cots, the main feature of [illegible] and general [illegible] to the varying demand [illegible] A cot coach [illegible]verted for sitting cases will [illegible] comfortably, for short [illegible] 18 and over have been [illegible] crowd[illegible] Without [illegible] a guard's van will hold [illegible] down The largest number [illegible] on the train [illegible] been 36[illegible]

[illegible] to 1st December [illegible] covering a total distance of 8,8[illegible]1 miles and [illegible] These were as follows —

	[illegible]	[illegible]	Total
Navy	[illegible]	561	799
Army	[illegible]	309	497
Bel[illegible]	[illegible]	333	478
Ger[illegible]	[illegible]	20	35
	[illegible]	1,223	1,779

The cases have been [illegible] medical, surgical and mental. Among these have been cases of [illegible] [illegible] fractures of all descriptions, bullet and shrapnel wounds.

ARRANGEMENTS FOR DEALING WITH THE WOUNDED ON BOARD SHIP

By Fleet Surgeon W. [illegible] COLBORNE, R.N.

The following instructions, which have been drawn up as complete and as simple in detail as possible, were issued to the medical staff of the [illegible] during 1913. Each individual member of the staff received [illegible] and was informed as to what part of it would constitute his [illegible] duty.

This organization may be of interest to medical officers serving in ships of the "Neptune" class. Possibly it may provoke discussion and a comparison of methods.

When War is Possible or Imminent.

(1) Check all medical and surgical stores, and make out demands to complete to full scale, including the extra issues for war as laid down in the Book of Scales of Medical Stores. (A list of these issues [illegible] is [illegible] ready, but is not included in these remarks.)

The demands should be sent to the naval hospital or depot at the port at which the ship will fit out, or to the depot to which the ship [illegible] in order that the stores may be packed ready for [illegible] at short notice if required.

The following stores also to be drawn if they have not already been [illegible]:—

[illegible] Paymaster of the Ship:—

[illegible] scissors, 12; towels, 30; blankets, 10.

[illegible] Boatswain:—

[illegible] slings, 4, for hoisting out stretchers after the action.

[illegible] Carpenter:—

Wooden battens, 5 pieces 3 in. wide by ½ in. thick and 5 ft. long, for [illegible] splints.

Wooden battens, 12 pieces 3 in. wide by ½ in. thick and 3 in. long, for splints.

Saws, small, 2, for cutting splints.

Sheets of tin, 6, for making splints.

(2) Pack the cupboards in the distributing stations with surgical dressings, which should be sterilized first, if possible. Labels of contents to be placed on drawers, &c., of cupboards.

Dressings to be placed in the cupboards are:—

- Lint in rolls and cut up longitudinally 4 in. [illegible]
- Cotton wool in rolls and cut up in the same way [illegible]
- Bandages, woven, calico and flannel.
- Cyanide gauze in tins, opened.
- First aid dressings.
- Scissors and safety pins.
- Slings of calico and flannel.
- Perchloride solution pellets.
- Picric acid dressings.

(3) Sterilize all surgical instruments, i.e., those in the [illegible] instrument chest, field chests, and pocket cases. The instruments [illegible] be sterilized in the metal cases and racks in which they [illegible] and replaced in the chests to which they belong.

(4) Draw from the Paymaster the medical comforts [illegible] and condensed milk. Place such as are likely to be required [illegible] diate use in the distributing stations with the [illegible] remainder in some easily accessible store or other comp[illegible]

(5) See that all the appliances for the supply of hot water [illegible] efficient state, and make out a list of what vessels and cans [illegible] for water, e.g., cans from officers' cabins, &c.

(6) Prepare antiseptic solutions. This refers to solutions [illegible] bulk and not from solution pellets. The solutions should be [illegible] concentrated form stored in the 40 oz. poison bottles and [illegible] labelled. Prepare also the following: Solution morphia hypodermic [illegible] in 5 ṁ (for use of medical officers only).

(7) Prepare a stock of first aid dressings of the sizes [illegible] 8 in., and 6 in. by 8 in. These dressings to consist of a piece of lint or ordinary lint folded with a piece of wool and kept in place by [illegible] covering with a bandage stitched across, to be made as the [illegible] or patterns kept in the sick bay. When finished these dressings [illegible] to be sterilized and wrapped separately in paper. They are [illegible] stored in the cupboards in the distributing stations and in the [illegible] haversacks. A supply should also be stored in the small drawers [illegible] the chest of drawers in officers' cabins in which they could be [illegible] when required.

(8) Pack all first aid haversacks according to the pattern kept [illegible] in the sick berth. Each haversack to have a luggage label [illegible] stating to what part of the ship it belongs.

Each Haversack to contain: Tourniquet 1, first aid dressings [illegible] each size, bandages 6 of sizes, pieces of lint for pads 10 [illegible] wool 10, slings 2, pieces of lint with bone [illegible], 6 [illegible] dressings 4. For engine room and stokeholds the picric acid dressings [illegible] to be 10 instead of 2 in the first aid haversacks.

(9) Get all service canvas cots ready for use after the action [illegible] stow them in the place told off on the list.

(10) Overhaul all stretchers and see that slings, pillows, &c. [illegible] satisfactory. Each stretcher to have a luggage label attached stating the part of the ship that will be worked by it after the action.

(11) Stow medical history sheets, &c., in a box and place in a safe place.

(12) Inspect the ship's company to eliminate the unfit as they would be landed before leaving port

(13) If possible, sterilize serge suits, &c for gun's crews and others roll them in handkerchiefs and place in bottom of men's bags ready for use during action

(14) Muster the first aid party, and see that they all understand the parts of the ship and the duties expected of them

(15) In accordance with Home Fleet Temporary Memoranda, No 116, of 11th April, 1911 two additional sick berth ratings would be sent to the ship

PRIOR TO LEAVING PORT AND ON DECLARATION OF WAR

(1) Draw medical and surgical stores previously demanded

(2) Land the unfit

(3) Dismantle the sick berth, and stow the articles in the distributing stations as shown on the list made out and kept in the sick bay, leaving only such articles as are required for immediate use These articles would be a few stock medicines and drugs, and a few surgical dressings and instruments for emergencies

DURING THE ACTION

(1) The medical staff and ambulance party will remain in the distributing stations to which they have been told off, until the action is over or there is a lull

(2) During the period of waiting, first aid dressings splints &c, can be overhauled, and the duties of the party fully explained to them

AFTER THE ACTION

(1) Immediately the action is over or there is a lull the stretcher parties will take the stretchers to the part of the ship to which they have been respectively told off as shown by the luggage labels attached to them The stretcher party, in addition to the stretcher will take with them a first aid bag of dressings, hot bovril and coffee as well as drinking vessels The bovril and coffee will have been previously made in a concentrated form, so that the addition of hot water would render it palatable and fit for use On arrival at their station the party will move the wounded from the turret or other place to the deck, and out of the way of the guns They will render such first aid as is possible, but the wounded are not to be otherwise moved without further orders

(2) The senior medical officer will make a rapid tour of the upper deck in order to get an estimate of the number and condition of the wounded, see that they are receiving proper attention, and give any necessary hypodermic injections attaching to each person given an injection a label, stating the dose and time to prevent duplication At the same time that the senior medical officer is going round the upper deck the staff surgeon will carry out a similar duty on the main deck

(3) If there is only a lull in the action then the senior medical officer and the staff surgeon will supervise the removal of the wounded to the bag flats and awning rooms by the stretcher parties These compartments are behind armour, and the wounded would remain there until the action is over, a certain number of the ambulance party being told off to look after them

(4) If the action is over —Whilst the [illegible] round the upper and main decks a party will rig [illegible] previously determined a temporary dressing station To the [illegible] station the stretcher parties will bring the wound[illegible] first aid dressings may be attended to and a selection [illegible] of those who will require special treatment, such as operation later After attention at these temporary dressing stations the stretcher parties will remove the wounded to a selected place for nursing

A list of articles required for these temporary dressing stations is made out and kept in the sick bay

(5) The insane or mentally affected would be placed in the cells or other selected place under a guard

(6) If weather and other circumstances permit and there is a possibility of the wounded being transferred to a hospital ship or shore establishment in a short time, those injured on the upper deck would remain there, and preparation would be made for disembarking them—by means of stretchers and chairs fitted with slings, and by derrick with a single whip

(7) If there is no chance of disembarking the wounded for some time the medical officers will select a site for an operation room the selection depending on light ventilation, and accessibility All the wounded having received efficient first aid treatment and their feeding and nursing having been arranged, then those requiring operation will be attended to, and any others requiring redressing As soon as possible each of the wounded should have attached to his person a label, stating his name rank rating, official number, the nature of injury how dressed and date and time of dressing

MISCELLANEOUS

Distribution of First aid Bags

Before action the first aid bags will be distributed as detailed below, each bag being labelled with the part of the ship to which it has been assigned —

1 bag to each turret
1 bag to each 4 in battery
1 bag to conning tower
2 bags to each engine room one to be the ordinary first aid bag the other to contain picric acid dressings only These bags to be labelled one " First Aid, the other " Dressings for Burns
2 bags to each stokehold the same as for the engine rooms
10 spare bags to be kept in each distributing station for use after the action as required

Distribution of Stretchers

Each stretcher to be manned by four men, and to be in charge of a man passed in first aid A first aid bag and supply of medical comforts water, and drinking vessels to go with each stretcher The stretcher will be taken to the part of the ship assigned to it after the action Each stretcher and bag to be labelled as to the part of the ship to be worked by them

1 stretcher for area around each turret
1 stretcher for area before wardroom galley on main deck

1 stretcher [illegible] r [illegible]room galley and ship's galley
1 stretcher [illegible] galley on main deck
1 Furley's [illegible] and stokehold use to be kept until required in after distributing station
1 Neil Robertson's stretcher to be kept in fore distributing station for use with operation table or as required

In the event of one distributing station being destroyed two stretchers will work the whole of the upper deck and two stretchers the whole of the main deck

After the action the surviving medical officer will make his station on the upper or main deck as he considers best and then the stretcher parties must bring all cases to him

Various Lists made out and kept in the Sick Bay

(1) List of additional stores to be demanded for war time.
(2) List of articles to be drawn from Paymaster Carpenter, and Boatswain.
(3) List of antiseptic solutions and mixtures to be made up
(4) List of contents of each first aid haversack
(5) List of articles required for temporary dressing stations
(6) List of articles to be stored during action in the fore and after distributing stations and other storerooms

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ACTION STATIONS IN TIME OF WAR

(In a Battleship of the King Edward VII Class)

By Fleet Surgeon A C BEAN R N (H M S 'Britannia)

Experience is always a hard master but often the lessons learned are of the best and are worthy of being recorded for future guidance The following notes are made with this object in view the ship having [illegible] more than four months 'prepared for action

This paper does not go beyond the limits of 'prepare for action and is intended to point out the difficulties of making satisfactory arrangements for the stowing of medical stores and appliances and for the treatment of the sick when action is postponed for months after the declaration of war

It has been customary during peace to 'prepare for war, for the Admiral's inspection two days are usually allotted to the preparation and then comes the inspection after which action stations are dismantled stores are returned and peace conditions once more prevail

So far at least as medical organization is concerned, this is a great mistake All preparations for war should remain existent for at least a fortnight (1) to test fully the efficacy of the arrangements, and (2) to accustom the medical staff in dealing with cases of sickness under war conditions

During war action may be imminent at any moment day or night it is therefore essential that all preparations should be so far advanced that little or nothing remains to be done to put us in a position to deal with wounded

[illegible] be left in the [illegible] formated [illegible] the action stations [illegible] been [illegible] corrected [illegible] more [illegible]

[illegible] for [illegible] All [illegible] and [illegible] not [illegible] station [illegible] pensary [illegible] used at all [illegible] considered [illegible]

What [illegible] can they be [illegible] requirements?

I.—The action [illegible] which are situated in [illegible] flats behind armour.

The after station [illegible] It is small [illegible] ventilated, and unsuitable [illegible] half of the medical and surgical [illegible] for [illegible] cots, &c, and as a position [illegible] the medical staff [illegible] to minimize the risk of all [illegible] staff being put out of action [illegible]

The main station (amidships [illegible] the place [illegible] have dispensary, surgical [illegible] station [illegible] medical and surgical appliances for [illegible] spare stretchers, X-ray apparatus, instrument [illegible]

The main station, which varies somewhat in [illegible] the class, but it is believed compares favourably [illegible] others, is approximately 30 ft. long, [illegible] ft. wide, and [illegible] high. It has nettings for hammocks and racks for bags, but [illegible] of the nettings have been cleared of hammocks and all bag racks [illegible] stowed elsewhere have been removed, leaving almost all the space available for medical purposes.

II.—The provision for stores [illegible] cupboard for dressings at each station, the upper part [illegible] fitted with shelves, the lower part [illegible] fitted with drawers.

The requirements for stores are:

(a) A dispensary cupboard for drugs and [illegible]

(b) A special cupboard for large [illegible] Winchester quart and contractor's bottle of spirits, oils, solutions, &c.

(c) A large cupboard for linen, blankets, pillows and mattresses.

(d) A cupboard with shelves and [illegible] for surgical dressings (wool, lint, gauze, bandages, &c.)

(e) A cupboard for crockery and [illegible]

(f) A cupboard for medical history sheets, books and paper.

The following arrangements have been made to meet the general requirements, but they are far from ideal, and some confusion may occur when dealing with numbers of wounded if stores are not immediately to hand.

(1) The top part of the dispensary cupboard has been moved below. It takes the contents of one No. 1 chest and [illegible] mixtures, but has no

spaces b[illegible] take the large [illegible] have been stored on one s[illegible] for dressings.

(2) Th[illegible] chest has been converted into a linen store. It takes [illegible] of [illegible] blankets and pillows the remainder of which [illegible] up into a bundle.

(3) [illegible] in a heap on top of a bag rack, and [illegible].

(4) A [illegible] has been obtained and filled with part of the [illegible] and half of the war supply of [illegible] and dressings, [illegible] of the peace stores at this station being stored in [illegible] and any drawers available.

[illegible] the sick bay, the Medical Officer's [illegible] of the dressing cupboard are used for [illegible] dressings and instruments for everyday use.

[illegible] dressing cupboard is set apart for medical [illegible] convenient place for the special cupboard.

[illegible] a mattress, spare stretchers and [illegible] in the [illegible] hammock netting and overhead as [illegible].

[illegible] not in everyday use are packed in a [illegible].

[illegible] are arranged on the spare [illegible] talk.

(9) [illegible] kept permanently rigged.

[illegible] (except [illegible] dressings) remain in the [illegible] thirds at the other station.

[illegible] is curtained off into two spaces [illegible] which has been improvised for [illegible] and dressings, &c.

[illegible] patients in bed, and this is only done [illegible] removal to hospital, bedding is taken [illegible] as required to the sick bay.

If [illegible] the patients are removed to the main station and slung [illegible] hammocks as usual.

The [illegible] in cold weather with watertight doors closed from about 70 [illegible] and in hot weather [illegible] 75 to 90 F. according to the length of time at sea and the number of boilers lit up. The ventilation [illegible] the fans running, and in bad weather at sea the atmosphere is infinitely preferable to that of the sick bay.

Plaster [illegible] cream do not keep well below; they are kept in the sick bay and taken below as requisite.

In conclusion an endeavour has been made to emphasize three essential points:—

(1) The necessity of having complete arrangements and fittings permanently at the main action station to deal with ordinary cases of sickness when the ship has to remain prepared for war for months on end.

(2) The necessity of having all stores below, and so arranged that they may be immediately ready to hand in case of a sudden action.

(3) The importance of testing these arrangements for a fortnight or more during time of peace.

Reviews.

[illegible] FOR THE ROYAL NAVY. [illegible] By Staff Surgeon George O. M. Dickenson [illegible] [illegible] Ltd 1914 [illegible] Price 2s net

This [illegible] provides a concise and [illegible] the sick berth staff [illegible] should also be [illegible] their clinical [illegible] surgery [illegible] [illegible] Naval Action and [illegible] [illegible] The [illegible] to tell the [illegible] the [illegible] to [illegible] the [illegible] diseases [illegible] to [illegible] expositive [illegible] injuries [illegible] is classified as [illegible] main [illegible] is dealt with in [illegible] who have mastered the book will [illegible] with that intelligent anticipation which [illegible] case. At the same time the [illegible] only [illegible] is to be given without [illegible] medical officer is not available. Although the [illegible] size the type is clear and the illustrations [illegible] appears to have omitted nothing useful, and [illegible] have been left out. [illegible]

OPERATIVE SURGERY. By Edward H. Taylor, M.D., [illegible] F.R.C.S.I., Professor of Surgery, University [illegible] [illegible] J. & A. Churchill. 1911. 1 vol. Pp. [illegible] in colour. Price 30s. net.

This excellent work on the operative surgery of the head and [illegible] the thorax and the abdomen in which are [illegible] only those operations most frequently required, and those a [illegible] would be called upon to perform should prove of great value [illegible] officers. An account of all the operations [illegible] is not given, but the book is comprehensive and [illegible] is that the present volume originated in connection with [illegible] courses in Trinity College, which from time to time [illegible] officers of the [illegible] have attended.

The [illegible] plan which [illegible] followed is to arrange [illegible] first [illegible] to the [illegible] and the author in all cases give [illegible] which by experience he has found to be the [illegible]

The illustrations which are numerous for the size of the volume [illegible] with one or two exceptions they are [illegible] being [illegible] stereoscopic photographs taken in the [illegible] representing various stages in the more important operations. [illegible] be said that the illustrations are unsurpassed in excellence of detail and with the explanatory notes which are given beneath each will alone well repay [illegible] study.

The volume comprises four Sections, No. I being devoted to surgical technique, which is described in detail. Here also is included an able account of anæsthetics and their administration written by Mr Adams McConnell, F.R.C.S.I. In Section II are the operative procedures in the [illegible] of head and neck, opening with cranial operations in which the author's methods in fractures of the [illegible] are fully given. Operation on the thyroid gland will be found at the end of this section. Section III is allotted to the thorax, and includes the operative [illegible] of breast cancer, empyæma and pericardial effusions. In Section IV the operations on the abdomen are described including the genito-urinary tract, the ureter, the prostate, the penis, the scrotum, testicle and spermatic cord. Here is given the author's modification of Bassini's herniotomy, the main feature of which is a less extensive division of the aponeurosis of the external oblique than is entailed by Bassini's operation. On nephrectomy, when discussing the relative advantages of urinary segregation and ureteral catheterization in estimation of the functional capacity of the kidneys, the former method appears to be somewhat favoured; it is admitted however that in the present day powerful advocates will be found for each of these methods.

The whole book is carefully written, lucid, but not voluminous and thoroughly up to date. It enhances the already high reputation of the writer as a surgeon and a teacher, and can be recommended with confidence.

W. L. M.

Gas Poisoning in Mining and other Industries. By John Glaister, M.D., D.P.H., and D. D. Logan, M.D., D.P.H. Edinburgh: E. and S. Livingstone. Pp. 470. With plans, 38 illustrations, 2 coloured. Price 10s. 6d. net.

The importance of the subject is one that should be well understood by naval medical officers, for though explosions like those that occur in mines do not take place in ships, yet instances of CO poisoning are not infrequent. The authors in their introductory chapter state that the greater part of the available information on this subject is either in Blue books difficult to get, or in works of physiology rarely read, many of the most important being by Professor Haldane. The symptoms and sequelæ of carbon monoxide poisoning are very various and often quite misunderstood; very frequently the affected person has a peculiar drunken appearance and serious errors have been made. It has been stated in the *Lancet* that CO is rapidly becoming a modern terror. After describing the various forms of "damps" and the injurious products generated in mines

[illegible] symptoms of [illegible] follow The experiments of [illegible] absorbed CO to the extent of [illegible] exertion and consist mainly [illegible] rest these come on when the [illegible] when about one third of the [illegible] At 50 per cent the person [illegible] when it is 80 per cent

It must be remembered that [illegible] the gas [illegible] although there may be only 1 p[illegible] atmosph[illegible] become saturated to 50 per cent [illegible] With prolonged [illegible] 1 per cent of CO recovery is [illegible] 0·2 per cent [illegible] ptoms appear and with 1 per cent [illegible] rapidly brought [illegible] The detection of CO in the blood [illegible] easily made by the [illegible] metric test Three tubes should be [illegible] In number one [illegible] of the blood with 99 of ordinary water [illegible] In number two [illegible] dilution of ordinary healthy blood If CO be present in the [illegible] colour will be more or less pink [illegible] two being [illegible] yellow The third tube should [illegible] determine the approximate degree of saturation a dilution of [illegible] made [illegible] it is passed coal gas This is then thoroughly shaken and the [illegible] repeated until the mixture is [illegible] The [illegible] estimation [illegible] be made as suggested by Haldane [illegible] spectroscope test [illegible]

The final chapter is devoted to [illegible]

This book is well worth a careful study and [illegible] recommended

P. W. [illegible]

MINOR SURGERY AND BANDAGING Heath Pollard [illegible] Edited by G. H. Morriston Davies M.D. M.Ch [illegible] London J and A Churchill 7 Great Marlborough Street W [illegible] Pp 467 239 illustrations Price 7s 6d [illegible]

The fact that this work has reached the [illegible] great is the demand for it From the present [illegible] "Poisons and their Antidotes" and "On Cas[illegible]" while that on "The Examination of the Patient" [illegible] latter and several additional operations [illegible] varicose veins, varicocele &c These changes constitute [illegible] provement on previous editions but [illegible] classified as minor surgery Difficult [illegible] with in a manner which is calculated to help [illegible] service with no opportunity of consultation Although [illegible] obviously intended for house surgeons we think [illegible] appointed to hospitals from sea going ships and [illegible] a course of hospital study will find that a careful perusal of [illegible] will refresh their memory on some of most useful practical points

R. C. M.

Abstracts and Translations.

[illegible] T. The Pathological Affinities of Beriberi and Scurvy. Journ. Amer. Med. Assoc. 1914, vol. lxiii, No. 15, pp. 1290-1291.

The work of FUNK and others has shown that if foods are deprived [illegible] deficient in substances known as "vitamines," those who use them as staple articles of diet are liable to suffer from certain conditions [illegible] deficiency diseases. The author includes among these [illegible] infantile scurvy, experimental scurvy of guinea pigs, ship beriberi, beriberi and polyneuritis gallinarum, but he excludes pellagra, about which we have not sufficient knowledge.

He gives a short summary of these conditions and in a table shows (1) The manner in which they overlap; (2) the chief pathological differences. He recognizes, besides ship beriberi, several varieties, [illegible] infantile and asylum beriberi, wet and dry beriberi, the Brazilian type described by LOVELACE, endemic dropsy and endemic peripheral [illegible]. When on a visit to South Africa with General GORGAS, he had an opportunity of studying a peculiar type of scurvy affecting the miners on the Rand and he was struck by the similarity of the cardiac condition as seen post mortem with that commonly present in true beriberi, viz. a concentric hypertrophy and dilation of the right side, the left being normal. Further study showed that there were also marked degenerations of the vagus nerves like those seen in beriberi. The disease was not infectious but depended upon the following factors: A staple diet of over milled corn, over cooked corn and over boiled meat with a deficiency of vegetables. On the clinical side the disease showed great variations, from mild cases with spongy gums only to those with extensive haemorrhages; some showed marked rickety symptoms with destruction [illegible] chondro-costal junctions and even collapse of the sternum as in [illegible]. [illegible] other cases were more like beriberi, but this disease [illegible] may be definitely excluded (even in a latent form [illegible] scurvy) by the fact that the knee jerks were always [illegible] moreover there was neither anasarca, paralysis, nor extreme [illegible] atrophy.

The Rand scurvy differs from the ordinary form by showing cardiac and vagus changes and by being less amenable to treatment. Scurvy thus shades off into beriberi in one direction and rickets in the other. He noted peculiar racial and personal idiosyncrasies, which have an unknown influence on the symptoms produced, for with the same deficient diet one set of African negroes may get scurvy, others neurites, and roughly a deficiency diet in a tropical African negro miner will produce severe scurvy, in a Cape Colony African labourer mild scurvy only.

P. W. B. S.

BRANDON (W. L.) and COOPER (E. A.). The Influence of Metabolic Factors in Beriberi. Journ. Amer. Med. Soc.

These authors have carried out a large number of feeding experiments with fowls for the purpose of determining the precise rôle which the anti-beriberi substances (vitamines) play in metabolism, and to fix the quanti-

tetive relatio [illegible] to the [illegible] Birds, as is well [illegible] rice, which [illegible] were the amount of [illegible] death takes place [illegible] did not prolong life [illegible] noticed in men, for well [illegible] than the underfed and [illegible] who [illegible] are not so liable as men [illegible] polished rice component of the [illegible] when no [illegible] generally produced an [illegible] of beriberi

From these [illegible] and these expe[illegible] that with rice eating people the [illegible] the quantity both absolute and relative of the pol[illegible] in other words the amount of antineuri[illegible] by the organism increases with the quantity of [illegible] for the prevention of beriberi, the proportion of th[illegible] stuff in the diet must be as high as possibl[illegible] stuffs deficient in the active substance should b[illegible] W B S

McCrae (W) The Phosphor[illegible] Oxid[illegible] *Journ of Hygiene*, 1914 vol xiv [illegible]

As the P_2O_5 is the indicator of the [illegible] likely to be for maize Fraser and St[illegible] which con tains 0 469 per cent of P_2O_5 pol[illegible] the polishings of rice 4 3 When the ph[illegible] milling off the outer part of the grain the [illegible] also lost and deficiency diseases ar[illegible] extraction of maize flour there was found t[illegible] though rather less loss of the P_2O_5 as compared with that of [illegible] It is therefore probable that the diet of maize meal is [illegible] as that of white rice When samples of maize were so treated [illegible] per cent of the original grain was converted into fine meal [illegible] of P_2O_5 (and therefore vitamine) was found to be very small

Experiments on 6 000 native labourers [illegible] Transvaal for whom maize is the staple diet, are being conducted [illegible] and the old meal the men being divided into two equal group[illegible] the incidence of disease among those using the new meal [illegible] less than in those using the old P W B S

Emery Nouvelle Contribution a l'Etude des Accidents du Salvarsan 1914 *La Clinique*

The occurrence of severe accidents and even death after administration of salvarsan or neo salvarsan made it necessary to search for the reason of these unfortunate results The first explanation offered was that the drugs were poisonous to man the patient researches of [illegible] however have shown that it is non toxic and the five years experience of its administration to man, even when given sometimes in very large doses, also disproves this but why, if it is non toxic in itself does it in some cases give rise to such serious reaction? The causes appear to be

various [illegible] They [illegible] into two [illegible] of the dr[illegible] [illegible] patient [illegible] faulty [illegible] prevent [illegible] exact alkal[illegible] water [illegible] slowly [illegible]

If [illegible] usual [illegible] sufficiently [illegible] any [illegible] employed [illegible] most marked [illegible] If the [illegible] symptoms [illegible] in severe cases [illegible] used, the [illegible] water [illegible] upon the [illegible] the [illegible] and [illegible] the third or fourth day after [illegible] extract may be given at that time. If the patient [illegible] hepatic and intestinal symptoms pointing to [illegible] carbonate of soda may be exhibited [illegible] probable, if these precautions are taken and [illegible] are given, accidents will become very rare.

P. W. B. S.

GAIZ IN SYPHILIS

The supply of [illegible] being out of [illegible] the treatment of syphilis [illegible] England [illegible] September 12 [illegible] with excellent results [illegible] Wassermann [illegible] good a [illegible] Paris.

P. W. B. S.

DISTRIBUTING STATIONS ON BOARD SHIP IN WAR TIME[1]

[illegible]

It [illegible] when [illegible] problem of the [illegible] difficult to [illegible] constructor [illegible] have not [illegible] on [illegible] It is [illegible] well [illegible] related [illegible] figures [illegible] with a [illegible] less [illegible] other hand a very [illegible]

By experience one [illegible] equipment of peace [illegible] the sick is excellently provided with [illegible] the rule to provide nothing useful [illegible] which appeared the more often [illegible] plans of the ship.

This omission is very [illegible] of our profession and still more [illegible] the State contracts towards [illegible] the greatest wish of the writer [illegible] of this subject.

In the older warships [illegible] a special distributing station [illegible] a temporary distributing station [illegible] engagement. [illegible] 1891 the [illegible] station and owing to the experience [illegible] had his dressing station [illegible] the [illegible] that moment [illegible] of the war with Russia [illegible] one was forced to choose [illegible] for the position of distributing stations [illegible] better a [illegible]

It was not [illegible] an easy thing [illegible] from all [illegible] the proposed [illegible] a grave inconvenience in the examination [illegible] and wounded. At other times the closure of [illegible] of a

---

[1] [illegible] offices of the present [illegible]

watertight door occasioned a rise of the temperature to an unbearable degree. During a long engagement the thermometer would often range to about 120° F. It would be as if one worked in an oven and both operators and patients would be equally troubled by headaches or by vertigo on account of the great heat. Moreover a badly situated distributing station leads often to numerous inconveniences in the transport of the wounded. Elsewhere there was not room to receive the wounded after treatment. In other places one found that the smoke of the guns, the coal and other dust flying into the distributing station, soiled the surface of wounds as well as the dressing materials; elsewhere the construction of the ship was so defective that sailors and others were obliged to pass through the station during the execution of their duties; again elsewhere the ventilation was bad and the confined air had a depressing effect on everyone in the station; or here, when the first stock of surgical accessories was exhausted it was very difficult to renew them owing to want of easy communication between the distributing station and the storeroom; at one time there was a defect in the supply of pure water; finally, touching on other points, the proximity of large guns would cause at each shot destruction amongst the bottles and the surgical instruments.

Such was the actual condition of the distributing stations on board the Japanese warships during the war with Russia, and it is quite exceptional to find an ideal distributing station giving complete satisfaction in arrangement and position. The author considers as follows the results obtained with medical equipment so inadequate.

The aim from the opening of the war was to treat all wounds by asepsis and in practice this method was used whenever it was possible. Nevertheless in spite of all efforts wounds suppurated frequently, and it was comparatively rare for the cases to run a smooth course. One can blame the nature of wounds received in naval warfare; they are usually of such a kind that it is difficult to prevent them from suppurating, but the cause of that must be, in part at least, due to the inadequate equipment of distributing stations. If these phenomena are compared with those which occurred in the China-Japanese War one will remark that though in the recent war the cases of suppuration were numerous, this suppuration was in general superficial and healing was rapid.

One can notice a difference between the two wars, and the conclusion to be drawn from them appears to be that with distributing stations perfectly equipped the ideal treatment of hurts and wounds on board warships would be capable of realization.

It is obviously impossible to overcome entirely all the obstacles which impede the way, though the majority can be avoided when it is a question to attain a favourable course and prognosis in hurts and wounds and accordingly to provide all the conveniences and all the resources of progress for the treatment of the wounded. Thus, from the beginning, in the plans of the ship, very special attention should be paid to the position of the distributing station, to the ways and means of transport of the wounded, and to the places for their reception. In this manner all the necessary arrangements for the distributing station can be realized to the complete satisfaction of everyone.

The increasing dimensions of the battleships and modern cruisers allow of a well defined position for exclusive use as a distributing station,

established and equipped during peace time. If, how[illegible] do not permit such an installation in time of peace it [illegible] after having chosen the position, everything that [illegible] placed there at least once for trial and afterwards [illegible] other movable articles could be collected on board [illegible] in a magazine from whence they could be rapidly [illegible] position at the desired moment. This place (i.e. th[illegible] in time of peace would have another designation, but it should [illegible] of quick and appropriate disinfection. During all the duration [illegible] it should be used for no other purpose than that of a distribut[illegible]

Number of Distributing Stations.—In the course of the Chin[illegible] War of 1894 and 1895, as already stated, the Japanese warship [illegible] used the officers' wardroom as a distributing station, with th[illegible] a projectile of the enemy exploding in this place, killed or [illegible] causing terrible injuries, all the persons present, and destroy[illegible] surgical equipment and the wound dressings. Not one surg[illegible] was saved to care for the surviving wounded, and there di[illegible] any medical stores with which to treat them. The author of [illegible] will never forget the grievous sight presented by the ruined wa[illegible] the end of the battle. In order to prevent a return of a like ca[illegible] it is desirable that at least two places be chosen and equipped to [illegible] distributing stations. If one is destroyed the other can still [illegible] The existence of two distributing stations situated in diffe[illegible] the ship would be also convenient for the rapid transport of [illegible] requiring medical aid.

Position of the Distributing Station.—The distributing statio[illegible] be situated in a part of the ship as much protected as possibl[illegible] enemy's projectiles. In a warship the protection is generally [illegible] below the water line, so that this situation would seem the sa[illegible] is difficult to find a convenient spot above the lower deck, and [illegible] consideration must always be given to the transport of the w[illegible] Also it is wise in the battleships and armoured cruisers to [illegible] equip on the lower deck places to serve as distributing statio[illegible] quite impossible to establish a common rule in the choice of [illegible] station for this object, because each ship has her own [illegible] her machinery, her engines, her means of attack and defen[illegible] one can lay down that a distributing station situated in the [illegible] breadth of the ship, with passages and means of access to p[illegible] starboard, would be very convenient for transport of the w[illegible] their treatment, and for their evacuation after dressing. If th[illegible] care is taken in the construction and equipment of a distributing [illegible] there will not be great inconvenience if it be to port or to star[illegible] earnest attention should be given to the following points:—

(*a*) When the distributing station is established in the neighbourhood of machinery or furnaces, the temperature may rise enough to hinder the work of the surgeon. A recent experience has proved this fact completely. If it is impossible to avoid altogether such places, heat insulators ought to be provided for parts exposed to the heat, especially the partitions, the floors, &c.

(*b*) It is not of first importance that the distributing station be well provided with natural light. The operations which will be carried out in a hospital situated on the armoured deck require always a good artificial

light It is important to have an excellent installation of [illegible] or other light

(c) Hatches with ladders should be provided close to the [illegible] station (the closer the better) for the transport of the [illegible] upper or principal deck by means of stretchers or by hand [illegible] also, near the distributing station ought to be provided a hatch [illegible] with a lift This hatch would be used as a communication between the upper deck and the station In peace time communication could be served by means of ladders in war time a lift would be fitted above to facilitate the transport of the wounded

(d) Temporary rooms to screen the wounded who [illegible] and or who have been already treated could be provided at the [illegible] of the station For this one can adequately utilize the passages or any other [illegible] place on the armoured deck

(e) The [illegible] distributing station will be chosen in all [illegible] shelter from coal dust powder smoke and other substances

(f) It is best to choose a position the least exposed to vibrations caused by the firing of heavy guns

[illegible] Distributing Station —The superficial capacity of [illegible] ought to be from 300 to 500 square feet the shape oblong by [illegible] or square However small irregularities are permitted The [illegible] ought to take place by a door opposite the lift [illegible] another door at the other side of [illegible] wounded after treatment, but in case [illegible] the same door could be utilized for entrance and exit

[illegible] in the following manner —

(1) An operating table

(2) [illegible] stand

(3) [illegible] sterilized water

(4) [illegible] instruments

(5) [illegible] sink

(6) [illegible] dirty water

(7) [illegible] dressings It is advisable to have an [illegible] pattern but it is not necessary that it be in the [illegible] to raise the temperature and to incon[illegible] patients It would be preferable to have it [illegible] the bathroom or on the principal deck where [illegible] in advance

(8) [illegible] accessories constructed outside [illegible] of easy access to the opening of the inner [illegible] sufficient size to hold all the *material* and [illegible] for operations

[illegible] the walls ought to be generously provided with fixed [illegible]

(10) [illegible] on channels with fixed interior ventilators [illegible] place above the upper deck ought to be [illegible] be sent in abundance through the [illegible]

(11) Walls ceilings and flooring to prevent deposit of dust on the walls [illegible] should be as smooth and as regular as possible The floor should be covered with linoleum and elsewhere with a light enamel paint Disinfection would then be easy

[illegible]

This ladder would be used as a [illegible] if the lift continued to act, because [illegible] on the upper deck, it is probable [illegible] distributing station and it would [illegible] by the ladders, and reserve the lift [illegible] small unarmoured ships each spot [illegible] exposed at the same time it is very [illegible] for a station above the water line. [illegible] ships of this kind still utilized the [illegible] station but these ships were rarely [illegible] experience of the battle of the [illegible]

Transport of the Wounded.—On board [illegible] is a problem very difficult to decide. [illegible] ought naturally to be carried on the stretcher [illegible] That is theoretically true and as the [illegible] neglect should not be permitted [illegible] The stretchers such as are used [illegible] adapted for service on board; there [illegible]

[illegible] Before the Russo-Japanese War the Japanese [illegible] one type of [illegible] beginning of [illegible] Totsuka [illegible] Imperial Japanese Navy [illegible] was found so [illegible] provided for [illegible] station was [illegible] men should be [illegible] stations [illegible] But this [illegible] practice [illegible] under [illegible] full wounded [illegible] for the [illegible] stretchers [illegible] adopt [illegible] being [illegible] In practice [illegible] which [illegible] were [illegible] that [illegible] but was [illegible] cannot be modified [illegible] select [illegible] only and [illegible] the ... ders.

The [illegible] transport of wounded [illegible] distributing station [illegible] hospital ship or a transport [illegible] can easily be modified [illegible] the wounded will have [illegible]

[illegible] a stretcher to be [illegible] contains for service [illegible] this stretcher being made [illegible] presents several great [illegible]

W[illegible] one is not to be [illegible] which will be employed [illegible] In the tops [illegible] special types of stretchers [illegible] be employed.

W. L. M.

[illegible] blind lumber stretcher.

News of the Service.

APPOINTMENTS

[illegible]

[illegible] O. W. [illegible] (Retired List) to [illegible]

[illegible]

[illegible] R. F. [illegible] (Retired List) to the [illegible]

[illegible]

[illegible]

[illegible]

Fleet Surgeons [illegible]

[illegible]

Staff Surgeons [illegible]

[illegible]

Staff Surgeons [illegible] W. H. [illegible] M.D., M.A., to [illegible] W. [illegible] Walker, M.B., to the Alastor.

Surgeons [illegible] M.B. [illegible] Emperor [illegible] R.N. Hospital [illegible] to the Dreadnought [illegible] to the Royal [illegible] M.B., to the [illegible] additional for hospital.

Surgeons [illegible] to the Pembroke, additional [illegible] to the hospital ship [illegible] to the Viking [illegible] M.B., B.A., to the [illegible] M.B., B.A., to the [illegible] J. L. Preston to the Royal [illegible]

[illegible]

... Portum and Royal Marines

OCTOBER.

Surgeon Probationers S R [illegible] to T B D Badger J A D Skinner [illegible] T B D [illegible] A G G Guinness [illegible] T B D Shark

NOVEMBER.

Surgeon Probationers A [illegible] Bee to T B D Garland F D Baxter to T B D [illegible] E A Dickson to T B D Nereide A F W[illegible] to T B D Fury [illegible] to T B D Redpole [illegible] to T B D [illegible] W [illegible] to T B D Acasta C J C Cooke to T B D Ambuscade S S Toulmin to T B D [illegible] Ratcliffe to T B D Acorn A J Murdoch to T B D Midge P R Raggall to T B D Brisk A G Brott to T B D Mason S [illegible] to T B D Nymphe [illegible] Hands to T B D Larne B H Pocock to T B D Staunch D B S Jones to T B D Minstrel E A Clegg [illegible] T B D Ardent C R Sharp to T B D Christopher [illegible] Caldwell to T B D Fortune T W Drummond to T B D Hardy F J Coombe to T B D Sparrowhawk A G Melhe [illegible] T B D [illegible] D H Francis to T B D [illegible] T J Sumner to T B D [illegible] R [illegible] T B D [illegible] D [illegible] T B D Jackal E A Leak to T B D [illegible] [illegible] Drury to T B D Lance W [illegible] to T B D Laverock

OBITUARY

Killed in Action

[illegible]

Killed in the "Bulwark" Disaster

[illegible] "Bulwark" when she was lost off Sheerness [illegible] 1914.

He was educated at Cheltenham College [illegible] [illegible] College Football XI Cup [illegible] B.A. [illegible] Natural Sciences Tripos, Part I [illegible] Addenbrooke's Hospital [illegible] M.B. [illegible] Royal Navy [illegible] He served in the Channel Fleet [illegible] Hospital [illegible] Training Squadron [illegible]

Surgeon William [illegible] M.B. [illegible] "Bulwark" [illegible] lost off Sheerness in November 1914 [illegible] graduated in 1906.

After a few months [illegible] surgeon [illegible] St. Mark's Hospital [illegible] China [illegible] July 1913 [illegible] gold medal [illegible] diploma [illegible]

Surgeon Robert [illegible] "Bulwark" when she was lost [illegible] November [illegible] 1914 [illegible] Hospital and took [illegible] diploma in [illegible] medal [illegible] joined the R.N.V.R. in [illegible] 1914.

Deaths from other Causes

SURGEON-GENERAL WILLIAM M[illegible] CRAIG, C.B., M.D., died on August 6, 1914. He was born [illegible] [illegible] Edinburgh University and took his degree in 1880.

After holding the appointment of House Surgeon at [illegible] Infirmary he entered the Navy in 1883 and [illegible] West Coast of Africa, in the Channel, in China (including a period [illegible] Hospital) [illegible] Chatham Division of the Royal Marines [illegible] Haslar Hospital. He was [illegible] Hospital Ship "Maine" [illegible] was presented to the [illegible] expiration of [illegible] Cape [illegible] Medical Officer [illegible] he went to Haslar Hospital [illegible] Fleet Surgeon in 1907 [illegible] Surgeon-General in 1910. When [illegible] retired on promotion to the [illegible] Surgeon-General in May 1914 [illegible] thanks of the Admiralty [illegible]. His skill as an operating surgeon was well known. He was [illegible] Companion of the Bath on June 3, 1913.

TEMPORARY SURGEON ALBERT LYELL [illegible] FAIRFAX [illegible] died of enteric fever at Dunkirk Hospital on October 1, 1914.

He was educated at Guy's Hospital, and, taking the London University Course, qualified M.R.C.S., L.R.C.P. in 1904. He was Resident Medical Officer at the Poplar and Stepney Sick Asylum, where he stayed until the War broke out. He was appointed to the "Devonshire" in the first week of the War.

FLEET SURGEON WILLIAM [illegible] died suddenly at sea on November 28, 1914, on board the "Alsatian" [illegible] Merchant Cruiser, of which he was Senior Medical Officer.

He was educated at St. Bartholomew's Hospital, obtained his diploma M.R.C.S., L.R.C.P. in 188[illegible], and entered the Navy in the same year. He served on the [illegible] China [illegible] Mediterranean [illegible] Stations, and in the Training Squadron. Although he had retired in 1906, he came forward again to serve his country at the outbreak of [illegible] and was appointed to the "Alsatian" on August 11, 1914.

SURGEON [illegible] ROBERTS, M.B., was drowned on December 19, 1914, when returning [illegible] in the Orkneys.

He was educated at Clongowes Wood College, [illegible] and afterwards at [illegible]. He studied at the University College, Dublin, and in 1907 took the degree [illegible] Royal [illegible] of Ireland. [illegible] student days he was closely [illegible] with the Mater Misericordiae Hospital, and after qualifying was resident at [illegible] Hospital, [illegible] Street, Dublin. In May, 1901, he entered the Navy [illegible] the Home Fleets [illegible] Mediterranean Station. He was then [illegible] to the Royal Marines at Plymouth, and early in 1914 was granted a [illegible] study at the Naval Medical School, Greenwich. Soon after the [illegible] joined the [illegible].

FLEET SURGEON JOHN NEIL ROBERTSON, M.B., M.S., died on December 22, 1914, at [illegible] Naval Hospital, Plymouth.

He was educated at the University of Glasgow, taking his degrees in 1895. He [illegible] Navy [illegible] 1896 and served on the Home Station, with the Home Fleets [illegible] Mediterranean Station [illegible] [illegible] the improvement of [illegible] interested [illegible] he was noted for his great mechanical [illegible] in the [illegible] Dockyard he invented a special [illegible] for the Navy. This [illegible] the "Neil Robertson" [illegible] adopted by the Admiralty [illegible] throughout the [illegible] 1914, when Staff Surgeon [illegible] charge of the "Blake" [illegible] promoted to the rank of Fleet Surgeon for conspicuous professional [illegible].

Notices.

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Journal of the Royal Naval Medical Service.

Original Articles.

PRELIMINARY REPORT OF A COMMITTEE APPOINTED BY THE DIRECTOR-GENERAL OF THE MEDICAL DEPARTMENT OF THE NAVY IN DECEMBER, 1911, TO INQUIRE INTO THE BEST METHOD OF TREATING WOUNDS SUSTAINED IN ACTION, ESPECIALLY DURING THE EARLY PERIOD AFTER THEIR INFECTION.

The Committee consists of Sir W. Watson Cheyne, Bt., C.B., F.R.S., Consulting Surgeon R.N.; Fleet Surgeon P. W. Bassett-Smith, C.B., R.N.; and Mr. Arthur Edmunds, F.R.C.S., Consulting Surgeon, R.N.

The work has been done partly at the Royal Naval Hospital, Chatham, and partly at the Royal Naval College, Greenwich. The committee have to thank the Director-General for the cordial support which he has given to the committee in carrying out the research; Surgeon-General Johnstone, R.N., in charge of the Royal Naval Hospital, Chatham; Fleet Surgeon Axford, R.N., and Staff Surgeon Minett, R.N., Surgeons to the Hospital; and Staff Surgeon Dudley, R.N., who has charge of the laboratory, for their cordial help. The work is by no means finished as yet, but the Committee feel that, especially in view of the great importance of the subject, the time has come when it is desirable to make a preliminary report of their work.

The chief object of the research was to study the best method of dealing with wounds in the interval between the infliction of the

[illegible] the patient at a [illegible] station or a [illegible] hospital where the wound could be properly [illegible] an interval not infrequently of several hours and sometimes even of days. During that time the infection of the wound, which occurred at the time of its infliction and probably increased afterwards from soiling with dirt or clothing, spreads and may become so firmly established that it cannot be eradicated by any means at our disposal. The application of a field dressing over the wound, with or without cleansing of the surface or of the skin around, can do little or nothing towards checking the spread of infection in the interior of the wound although it may prevent the entrance of fresh infective material. On the other hand if some antiseptic substance could be introduced into the wound at the time of or soon after its infliction which was capable of diffusing through the blood clot and tissues and inhibiting the growth of bacteria till such time as thorough disinfection could be carried out a great deal might be gained as regards the prevention or diminution of sepsis and other pathogenic [illegible].

The problem then was to find such a substance which would diffuse in the blood in a wound and the tissues which form its wall and inhibit the growth of the bacteria in the area through which it diffused till such time as the wound can be thoroughly disinfected. There are thus two points involved in this problem viz. the physical one of diffusion and the bacteriological one of inhibition and it might at first sight seem that each point must be tested separately. It is not however so, because if a substance diffuses readily, but does not inhibit the growth of bacteria it is useless for our purpose, while on the other hand if a substance which has a powerful inhibitory or antiseptic action on bacteria will not diffuse through blood clot or tissue and still retain that action it is also useless. Hence it seemed to us that the simplest way to ascertain what we wanted was to interpose between the chemical substance to be tested and a layer of living bacteria a piece of blood clot or of tissue of a certain thickness say a quarter to half an inch and see whether the subsequent growth of the bacteria was in any way interfered with. If it was interfered with then the chemical agent must have been able to diffuse through the intermediate substance and to retain its inhibitory properties, while if on the other hand growth occurred the chemical agent although it might be a powerful antiseptic when in immediate contact with the living bacteria would be of no use for our purpose.

The next question was to decide what sort of medium would be most suitable as a basis for the antiseptic, so that it would not escape at once or quickly from the wound, but would remain there for some time and continue to exercise its inhibitory action. It had further to be borne in mind that in a wound we have not only to do with the tissues and a stationary blood-clot, but that serum is constantly being poured out and fresh blood is also escaping, and it is necessary that the antiseptic should remain *in situ* and be in sufficient abundance to impart its inhibitory influence to these constantly changing fluids. Simple fluids of whatever kind would be washed away and would at most only exercise a transitory effect, and it is evident that the chemical substance must be introduced in a more or less solid form and in a medium which will stick about a wound. A powder alone would be inconvenient and possibly also inefficient, because it would be difficult to introduce into the recesses of a deep wound or, if introduced, would, like the fluids, tend to be washed out by the blood and serum. And further, the powder might take a considerable time to dissolve in the fluids and we can hardly conceive that these substances can diffuse or act except in solution. Hence we decided to make a sticky paste of some kind either by mixing the antiseptic with some greasy basis or else in the case of powders making a paste with water and some substance such as gum tragacanth which will hold the mass together, inert powder being added if necessary, to give sufficient consistence. If the antiseptics are freely soluble, they diffuse too rapidly and as fresh serum or blood is poured out they are either washed away bodily or are quickly exhausted and no further store is left in the wound. Where, however, the antiseptic is not readily soluble, pastes of the latter kind seem likely to answer the purpose very well. In the case of more soluble or entirely liquid antiseptics the combination of the antiseptic with some greasy ointment basis seems, however, to be the most satisfactory arrangement. Most antiseptics can combine with such bases and are not readily washed out; as a rule they go on diffusing gradually and in this way a store of the antiseptic is provided which continues to act although a portion may be carried away by the serum which escapes from the wound; where a quantity of the antiseptic is thus stored up it may produce its effect for some considerable time. A further point is that a large amount of an antiseptic can thus be introduced into a wound without doing any harm. After making many experiments we have in the latter case used as a base for a good

many of the antiseptics [illegible] with which sufficient white wax has [illegible] to give it the necessary solidity, the usual proportion [illegible] six parts and beeswax one part. *The white wax cannot [illegible] by paraffin, as this substance markedly retards the action [illegible] antiseptics.*

We have also considered the strength [illegible] these pastes might be used by testing the amount [illegible] produced by different strengths and also by testing their [illegible] the tongue and on the skin.

We have further tested to a certain extent the [illegible] some of these pastes in wounds in guinea-pigs and [illegible]

Experiments with blood clot

We began by using blood-clot for the purpose of testing these questions of diffusion and inhibitory power of antiseptics, but finding that in a considerable number of cases the result was very much the same with nutrient agar we have also used that material very largely. Ultimately we propose to test all of the antiseptics which seem likely to be of any value in both ways.

As regards blood-clot, various methods have been adopted, of which the following is the one most frequently employed. The blood is collected at the butcher's, without any precautions against infection, in a long but comparatively narrow jar (3 in. wide) and this is placed in an incubator for some hours. This is usually done at night and next morning a long round clot has separated out from the serum and is turned out on a large flat dish. Two long thin knives are fastened together parallel to each other, leaving an interval between the blades of ¼ in. With this double-bladed knife the large roll of blood-clot is cut up into a series of discs ¼ in. thick. A measured quantity of the paste to be tested is placed on a microscopic cover-glass of a definite size (usually 1 in. in diameter) if in an ointment basis or in a paraffin cell of the same size if in the tragacanth base and this is laid on the bottom of a dish. The disc of blood clot is then placed over this, the dish covered and placed in the incubator. As a rule the blood clot is fully contaminated, no precautions having been taken to prevent that occurrence, but in most cases an emulsion of bacteria (usually *Staphylococcus pyogenes aureus*) has also been brushed over the surface. Observations are made from time to time, partly with the naked eye, but also by microscopical examination for bacteria and by cultivation from the surface. Another plan which has also been adopted in some cases is to cut the roll of blood-clot into large

blocks, stand them up in a dish and inject the pastes to be tested into them in various parts as shown in fig 11 In this case also cultivations and microscopical examinations have been made both from the surface and also from the interior of these masses of clot

A few tests have also been made with slices of meat which will be referred to later

Experiments with Nutrient Agar

This medium is more suitable for preliminary work as it is more or less transparent and more accurate observations can be made with it than with blood clot Hence we have of late used it for the preliminary observations and later have, in the case of those substances which we have had time to study more minutely, repeated our observations with blood clot in the manner described above The medium which we have used contains 3 per cent agar and Witte's peptone.

We have attempted to make all these experiments under exactly the same conditions When making comparative experiments we always use the same amount of the paste by weight and apply it over the same area of the agar In the case of the ointment pastes we have generally used 1 grm by weight and usually in a 20 per cent strength, so that 0 2 grm by weight of the antiseptic has been applied to the under surface of the agar The desired quantity of the paste is weighed out and placed on a microscopic cover glass, 1 in in diameter This is gently heated till the paste melts and forms a uniform convex layer on the surface of the glass when it is allowed to cool again (We are now however, using paraffin cells instead of cover-glasses in all cases The construction and advantages of these will be presently mentioned) A circular slab of agar, 3 in in diameter and ¼ in in thickness is then prepared by pouring the liquid agar into a mould designed by Mr Edmunds This mould is made by taking two square pieces of glass a brass ring ¼ in thick incomplete at one part, and three ordinary letter clips One piece of glass sterilized in the flame is laid down on the table, the brass ring is then sterilized in the flame laid on the upper surface of this glass, and then the second piece of glass also sterilized is laid on the top The whole is then bound together by the letter clips as shown in fig 1

Different thicknesses of agar can be obtained by using brass rings of varying thickness The apparatus can also be put together, a little plug of wool placed in the opening in the brass ring and the whole sterilized in the sterilizer but this takes more time The

[illegible]ll is now suspended (between two test-tube racks is as convenient a way as any) with the opening in the brass ring upwards and liquid agar is poured in till it is full; the agar is then allowed to set. The cell is now laid down on one side, the clips removed, the upper glass plate lifted off and the cover glass with the paste is laid on the centre of the agar. The brass ring is now removed, the lower plate and a large Petri dish placed over the slab and the whole inverted; with a little manipulation the agar slab with the paste and cover glass beneath it can be made to drop into the Petri dish. An

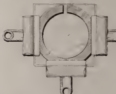


Fig. [illegible] [illegible] [illegible]

[illegible] the bacterium (we have so far only employed *S. pyogenes* [illegible] and in a few cases *Bacillus subtilis*) which has been previously [illegible] is now brushed over the upper surface of the agar slab and then some liquid agar is poured into the dish around the slab so as to fix it and also to prevent the escape of any gas should the antiseptic tested be volatile. Finally the cover is placed on the Petri dish and the whole put in the incubator. When a more liquid paste is employed, such as that made with tragacanth, it is placed in a paraffin cell 1 [illegible] in diameter instead of on a cover glass so as to confine it as far as possible to one limited area of the agar. If a liquid alone is to be tested, circular layers of filter paper (1 in. in diameter) saturated with the fluid are placed in the paraffin cell. The practice with the discs of blood clot has been the same.

The paraffin cells (see fig 2) are prepared by making holes in a flat sheet of paraffin wax with an ordinary 1-in punch It is advisable to work with a uniform thickness of paraffin and we now use a sheet, 1 sq in of which weighs 1 gm This is readily obtained by melting the wax over water We take an ordinary flat enamelled photographic dish 13 by 10 in i e with a surface of 130 sq in, to produce the requisite thickness 130 gm of wax would be required but as the sheet is apt to be a little thicker at the edge we allow another 10 gm The dish is half filled with water and warmed over a [illegible] burner till the paraffin melts The flame is then withdrawn and the dish allowed to cool when a uniform sheet of paraffin of the necessary thickness forms on the surface of the water This sheet is cut into strips

[illegible]

[illegible] with a knife and [illegible] To make the [illegible] cells requires a little care If [illegible] attempts to punch them [illegible] the sheet [illegible] to crack [illegible] the punch too much the holes will be too large [illegible] the punch slightly press it against the strip [illegible] then push the paraffin through the lumen of the punch with the finger With a little practice holes an inch [illegible] readily and accurately The paraffin [illegible] with a warm knife [illegible] plate till the [illegible] square and any roughness is smoothed away with a sharp knife

This cell is laid on the surface of the [illegible] the case of the cover glass and [illegible] whatever [illegible] is spread inside the circle A larger square [illegible] applied over the opening in the cell and fixed in place by slightly melting the paraffin all round by a warm rod

After some hours the Petri dish is removed from the incubator

and examined either with the naked eye or with a lens to see if bacteria are growing. As a rule colonies of bacteria are visible with a lens after three hours and with the naked eye after five hours. In control plates where no antiseptic is employed growth occurs more or less uniformly over the surface of the agar (see fig. 1). If, on the other hand, an antiseptic is employed and it is able to diffuse through the agar growth is interfered with over the centre of the plate corresponding to the position of the cover glass or cell behind and over a further area, the whole extent of this area corresponding to the diffusibility and activity of the antiseptic and also to the amount employed and the extent of surface over which it is applied. If the antiseptic employed diffuses through the whole thickness of the agar quickly (i.e., before colonies have had time to form) and possesses sufficient inhibitory power to prevent growth, the area of diffusion is indicated by a clear area on the agar where no colonies are present, this being surrounded by a ring of growth. If the substance tested has no antiseptic power or at any rate not sufficient to inhibit growth, or if, possessing antiseptic power, it cannot diffuse, or loses its power in so doing, or if it is in too small quantity, no such clear area is seen, and it is evident that such substance, at any rate in the strength and medium employed, is useless for our purpose. All the antiseptics which we have so far tested and which are able to diffuse sufficiently through agar or blood clot to inhibit growth, do so in time to produce a clear area, varying in extent with the nature of the antiseptic, its strength and the basis in which it is present. These points are being tested with various antiseptics. In the accompanying illustrations examples of the diffusibility and activity of different antiseptics under varying conditions will be seen.

Further investigations have been made with several antiseptics in order to ascertain whether this clear area simply means inhibition of growth or whether the bacteria also die and over what distance this effect of the antiseptic extends.

We have tested a large number of substances as to their diffusibility and activity in relation to agar, but it will be readily understood that these investigations take much time, and we have only as yet been able to study at all thoroughly five antiseptic substances—viz., carbolic acid, cresol, iodine, salicylic acid and double cyanide of mercury and zinc. Results have, however, been obtained with other substances which show that they also ought to be studied equally carefully, and this will be done. Various side issues, such as the search for more suitable bases, the relation of the

PLATE 2

[illegible]

[illegible] the forms of [illegible] [illegible] deserve investigation. These [illegible] be continued during the summer, but in the meantime, [illegible] the urgency of the matter, it seems well to send in a [illegible] report on the work which we have already done.

Experiments on Animals

Experiments have also been made on guinea pigs [illegible] narrated in connection with various antiseptics. It is [illegible] easy to devise experiments corresponding to wounds in [illegible] small animals like guinea pigs the character of the [illegible] tissues and the whole conditions are very different, and [illegible] not seem to be the same tendency to localization of the lesions as in man. In the case of man the ordinary infections which we have to do with in connection with wounds are essentially local, at any rate in the early stage, and frequently limit themselves to setting up various kinds and degrees of local inflammation, and are thus amenable to local treatment. In guinea pigs the same organisms may rapidly set up a blood disease, so that it is very difficult or impossible to overtake them by local treatment. We shall narrate our experiments so far as they have gone under the head of the various antiseptics.

We have made two sets of experiments, the one with non spore-bearing organisms which produce marked local action and the other with the bacilli of tetanus and of acute spreading gangrene. The organisms which we used for the first class of experiments (to illustrate local sepsis such as is produced in man by the various pyogenic cocci) were a particularly virulent strain of *Bacillus pyocyaneus* mixed with a cultivation of *Streptococcus pyogenes*. This caused marked local suppuration and sloughing as well as a general infection of which the control animals died. As regards acute gangrenous processes we obtained cultivations which had originally been derived from the Marne Valley, but the organisms had completely lost their pathogenic properties. The same was the case with various strains of tetanus, but we ultimately obtained through the courtesy of Dr. L. S. Dudgeon a sample of earth which was very rich in *Bacillus aerogenes capsulatus* and the tetanus bacillus both of them in a highly virulent condition. Guinea-pigs infected with this earth died in thirty to forty eight hours with acute hæmorrhagic œdema and inflammation of the parts, or if they lived longer they developed tetanus.

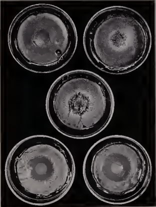
[illegible]

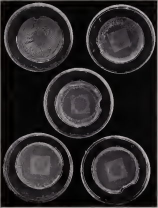
[illegible] with [illegible] [illegible] [illegible] and [illegible]

[illegible]

[illegible] The paste used was [illegible] over an area of [illegible] affects the growth [illegible] fewer colonies on the [illegible] glass than elsewhere but [illegible] The 10 per cent paste [illegible] colonies in the centre than [illegible] marked inhibition while [illegible] no growth over the area corresponding to the [illegible] speak of [illegible] as the "centre," but also over [illegible] that area [illegible] the 30 per cent the clear [illegible]

[illegible] of these facts in the first place as regards the [illegible] As has been already said, if an agar disc [illegible] but without the application of any antiseptic [illegible] less at the end of three hours [illegible] growing all over the surface and at the end of [illegible] be visible [illegible] If one of the plates shown [illegible] photograph [illegible] were examined [illegible] at the end of three hours colonies would be seen all around the [illegible] over the area which will remain permanently clear. Hence [illegible] has diffused through [illegible] of solid agar in sufficient quantity to inhibit the growth of bacteria in a shorter space of time than three hours, otherwise colonies would have been seen though they might have [illegible] small [illegible] more antiseptic came through and inhibited growth. [illegible] point is the small amount of antiseptic which has produced th[illegible] In the [illegible] per cent specimen only [illegible] gr. of





carbolic acid was present [illegible] only 1½ gr The [illegible] of the [illegible] has [illegible] produced the effect seen As we shall show [illegible] different bases hold up the antiseptic to varying extents [illegible] bases only parts with the carbolic acid comparatively [illegible] the immediate effect as shown by the extent of the [illegible] by only a small proportion of the acid in the paste [illegible] of the very potent action of the antiseptic.

The effect is still better seen if a larger [illegible] paste is applied over a larger area and for purposes of comparison we have generally used 1 grm of a 20 per cent paste over an area of 1 in (a 1 in cover glass or paraffin cell being employed)

Fig 5 illustrates a similar series with 1 grm of the paste over an inch area the strengths being 5 per cent 10 per cent 20 per cent 25 per cent and 30 per cent It will be seen that the increase in the amount of paste used and the increased area to which it has been applied has had a very marked effect on the result The actual measurements of the clear areas are 5 per cent 16 mm 10 per cent 42·7 mm, 20 per cent 48·5 mm, 25 per cent 57·8 mm and 30 per cent 64 mm

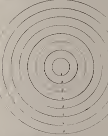
If we now study further one of the higher strengths say 20 per cent carbolic acid (fig 6) we notice not only the extent of the clear area but that the colonies at the margin of that area are smaller than those further out and if we examine the plate with a lens we see still smaller colonies at the outside of the area which to the naked eye appears clear As these colonies do not increase in size after several days in the incubator while those at the margin of the plate do, it is evident that while the antiseptic did not diffuse quickly enough to inhibit the growth of [illegible] colonies outside the clear area it still went on diffusing and inhibited the growth of colonies which had already become visible to the naked eye This point is perhaps best shown in fig 22 (Balsam of Peru)

We estimate the extent of diffusion of 20 per cent carbolic acid in a lanoline and wax base in solid agar in sufficient quantity to inhibit growth in a good deal less than three hours as 11 2 mm and the [illegible] inhibitory action as 15 mm

A further point of great importance which [illegible] with regard to all these antiseptics, is whether their power is limited to inhibition of growth or whether the organisms whose growth is inhibited are also killed and if so within what time It will be found that there are considerable differences in this respect between the various antiseptics To test this we have made cultivations from different parts of the surface of these plates at varying periods of time after the commencement of the experiments and in order to have a gauge for comparison we have drawn a series of circles 6 mm apart on the surface of a card these circles being numbered from the centre 1 2, 3 &c (see fig 7) If the lid of the Petri dish is removed and the dish placed on the top of this card so that the cover glass occupies circles 1 and 2 (i e, the centre), the circles can be seen through the agar and a record can be made of the circles from which cultures were taken If the matter were important, smaller circles could be drawn and a still more accurate table could be drawn up but these 6 mm circles give a fair idea of what is occurring In order to save time and material

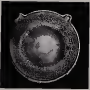
[illegible] we [illegible] of platinum wires (6 prongs [illegible]) [illegible] applied to the surface of the culture [illegible] prong being applied over the edge of the agar slab, and then [illegible] is stroked over fresh agar we get the result as regards growth [illegible] various distances from the centre side by side (see figs 29 and 30)

[illegible] results as regards carbolic acid are as follows During the first [illegible] there is as a rule free growth from all the zones at the



[illegible] part of the plate from which cultivations have been taken

[illegible] the growth from the centre is decidedly less than [illegible] few colonies appearing in the culture and after [illegible] growth at all is obtained from the centre while only [illegible] from No 3 In twenty four hours No 3 is [illegible] No 1 also Hence after the use of a 20 per cent [illegible] and wax base the bacteria within a range of [illegible] to die within three hours and are all dead [illegible] and this sterile zone steadily extends for the next [illegible] In some cases in cultivations taken from the



one [illegible] or three [illegible] to [illegible] actual death [illegible] of the organ[illegible] considerable time must elapse after [illegible] of the antiseptic before they can [illegible] they also lose their virulence at the sa[illegible] a short time in carbolic acid was [illegible] of the [illegible] employed for reducing the virulence of anthr[illegible] so that this might be used as a vaccine[1]

There is one other question wh[illegible] with regard to these clear areas viz., Can bacteria be subsequently grown on them? In one experiment we painted a fresh cul[illegible] staphylococci over the clear areas on plates of carbolic acid [illegible] paraform twenty one days after the original experiment, but [illegible] *[illegible]urred*

We have also used an emulsion of [illegible] organism—*Bacillus subtilis*—instead of the staphylococci [illegible] with 20 per cent carbolic acid in the lanolin and wax base and [illegible] also we obtain the same kind of clear area as with the staphylococci [illegible] cultivation test which we made, twelve and a half hours after the experiment was performed the subculture from the centre did not grow till after three days and for the first twenty four hours the subculture from No 3 was not so copious as that from No 1 Here also apparently the [illegible] took some time to recover from the effect of the antiseptic We have not yet had time to pursue this matter further with regard to sp[illegible] bearing organisms

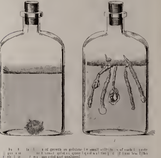
So far we have been describing results obtained by mixing carbolic acid with a base consisting of 5 parts of lanolin and 1 part of white wax The amount of diffusibility differs, however very considerably according to the base with which it is combined (see figs 8 and 9) If for example, the carbolic is combined with ung paraffini (see fig 9) or if paraffin is substituted for the wax in the lanolin and wax base, or if anhydrous lanolin and paraffin are used, the clear area is very much less than that described above, the 20 per cent paste giving a clear space hardly greater than the area to which it is applied, whereas if pure lanolin is used the diffusion is greater than with the lanolin and wax base When combined with pure lanolin, however the paste is practically liquid and unsuitable for our purpose while it is also much more pungent to the tongue, and therefore probably more irritating to a wound Undiluted liquid carbolic acid (3 minims on filter paper in a paraffin cell) gives practically a clear slab slight appearance of small colonies being evident at first around the edge but no further growth occurs

In January last two square flat bottles were sterilized and filled about three quarters full with agar in which a small quantity of an emulsion of *Staphylococcus pyogenes aureus* had been shaken up Before it solidified a fairly thick glass rod was fixed half way down the centre of each bottle of agar and withdrawn after solidification was complete leaving an open channel A piece of lint which had not been sterilized was dipped in the emulsion of the cocci and was then pushed down to the bottom of this central canal in each vessel In one (the control) nothing further was done, but in the case of the other a small quantity of the 20 per cent

[1] See *Comptes Rendus* vol xcvi, p 1088

carbolic acid paste (in the lanolin and wax base) was injected down this central canal and then the nozzle of the syringe was introduced in four directions into the substance of the agar. The result was that growth occurred in the control vessel while the other remained absolutely sterile.

Similar experiments were performed with gelatine, an emulsion of *Micrococcus prodigiosus* being used; the bottles were not placed in the



[illegible] of growth in gelatine by small [illegible] of carbolic paste [illegible] vessel gelatine quite liquid [illegible] has solid and unaltered.

incubator [illegible] kept in the laboratory at the ordinary temperature (see fig. 10). The control vessel (*a*) showed marked growth, the gelatine becoming gradually liquefied, and ultimately after six weeks completely liquid and [illegible] in colour, while the bottle into which the paste was injected still remains perfectly clear and solid (*b*).

EXPERIMENTS WITH BLOOD [illegible] AND A[illegible] TISSUE

We may [illegible] one or two of our earliest experiments

Experiment I — (a) A piece of blood clot weighing [illegible] oz was mixed with [illegible] dr of a 10 per cent carbolic paste (in lanolin and wax) and kept in [illegible] incubator for twelve days At the end of that time the clot was [illegible] solid and had no putrid odour but a few long chains and clumps of cocci were found on the surface on microscopical examination [illegible] bacilli were seen

(b) Six minims of undiluted carbolic acid were mixed with the same quantity of blood clot and at the end of twelve days the clot was still solid and sweet and no bacteria were found on or in it whether microscopically or by cultivation

(c) A control piece of blood clot with nothing added to it was at the end of the same time a liquid putrid mass and was swarming with bacteria of all kinds

Experiment II — A large cylindrical vessel was filled with blood at the slaughter house the blood being taken without any antiseptic precautions When the vessel was brought to the laboratory it was placed in the incubator overnight and then in the ice chest for four hours A solid cylinder of clot was thus formed floating in serum This was turned out on a flat dish the serum drained off and the clot cut into slices like a Swiss roll with an ordinary knife These slices naturally varied in thickness A certain amount of the antiseptic to be tested was then placed at the bottom of a Petri dish the slice of blood clot laid over it, and a little cotton wool packed round the edge to absorb any further serum which might be squeezed out Although the clot was of course full of bacteria already the surface was inoculated with *Staphylococcus pyogenes aureus*

(a) In the control dish the blood became liquid and putrid, and was full of organisms of all kinds

(b) In one dish clot 4 mm thick a small pledget of wool dipped in undiluted carbolic acid was placed in the middle of the Petri dish and the clot laid on it Here the clot remained sweet and solid and cultivations taken from the surface remained sterile

(c) In another dish some carbolic acid paste (10 per cent) was used the clot in this case being 8 mm thick This also remained sweet and solid, but a few scattered colonies of staphylococci were obtained from the surface on cultivation

Experiment III — Similar experiment but the slices of blood clot were of more uniform thickness and the surface was painted with *Bacillus coli communis* In this case different strengths of carbolic acid in the lanolin and wax base were tested Examined after two days with the following result —

(a) Control Diffluent and stinking and swarming with bacteria

(b) Five per cent carbolic paste Diffluent except at centre corresponding to the area of the paste where there was a small clear and solid area

(c) Ten per cent carbolic paste Clear, solid centre (1 in in diameter) growth elsewhere

(d) Fifteen per cent carbolic paste Larger clear and solid centre (1½ in) Colonies at periphery No organisms found by microscope or cultivation over the clear area

(c) Twenty per cent carbolic paste. Clear and solid centre (. . .), all colonies outside. No organisms over clear area (microscope and cultivation).

Since that time we have worked out the more precise methods referred to before, the double bladed knife giving a constant thickness of clot, the exact quantity of paste on cover glasses or in paraffin cells and so on, and our results with blood clot correspond in every particular with those obtained with agar, and the further experiments need not therefore be detailed.

Experiments with Animal Tissues

(1) A slice of fresh beef about ½ in. thick was obtained from a butcher's shop and was laid over an inch cover glass on the surface of which was 1 grm. of the 20 per cent. carbolic paste (lanolin and wax base) and placed in the incubator. An area of the meat corresponding to one and a half times the diameter of the cover-glass remained sweet and unaltered, while the surrounding part of the meat putrefied.

(2) A guinea pig was killed in the laboratory. We cut away the side of the thorax, ribs and soft parts, forming a circle about 2 in. in diameter. This was placed in a Petri dish over a cover glass with 1 grm. of 20 per cent. carbolic paste. Quite a thin layer of agar was run over this so as to enable us to see colonies (if they grew), and when this had solidified the surface was painted over with an emulsion of *S. pyogenes aureus*. No growth occurred except quite at the edge and the tissues in the central area remained apparently unaltered.

Experiments on Guinea Pigs

A.—Experiments with non spore bearing organisms, a mixture of virulent Bacillus pyocyaneus and Streptococcus pyogenes.

(1) Control. A small square of lint was soaked in a strong emulsion of these organisms and introduced into a wound in the subcutaneous, and slightly also the muscular tissue over the shoulder (in this plan the fluid which is squeezed out of the lint tends to run under the skin for a considerable distance and is not confined by fat and fascia as in man; it also escapes on to the surface of the skin). The wound was stitched up. The operation was followed by severe suppuration; the animal rapidly lost weight and was killed in seven days. *B. pyocyaneus* was present in the wound.

(2) Lint introduced into a wound as above and carbolic acid paste (30 per cent.) squeezed into the wound *immediately afterwards*; the wound was then closed by stitches. No local symptoms for four days and the animal gained weight. The animal then began to lose weight slightly and a little suppuration occurred. The wound was opened and cleaned out, the piece of lint being removed; the animal rapidly got well. No *B. pyocyaneus* found in the wound.

(3) Carbolic paste (30 per cent.) introduced *fifteen minutes* after infection. Gained weight and no suppuration for four days, then slight suppuration but no *B. pyocyaneus* found. Recovered.

(4) Carbolic acid paste introduced *half an hour* after infection. Rapid

loss of weight, suppuration and necrosis [illegible] killed [illegible] found

It appears, therefore, that up to fifteen m[illegible] the carbolic paste is able to diffuse in the wound in the guinea pig [illegible] destroy the bacteria or inhibit their action for four days After [illegible] the organisms seem to have got beyond the reach of the paste

B —*Experiments with earth containing Bacillus aerogenes capsulatus and tetanus bacilli*

With the view of ascertaining the average lethal dose of this earth various experiments were done which showed that 0·2 grm was always lethal They further showed that carbolic acid did not injure the animals nor did it cause a non lethal dose of the earth to become lethal For example, 0·023 grm of this earth was introduced under the skin, and fifteen minutes later 30 per cent carbolic acid paste No effect Similarly there was no effect if the carbolic acid paste was introduced five minutes after infection with this quantity of earth Undiluted liquid carbolic acid applied to wounds in guinea pigs (three cases) caused (1) increased flow of blood (2) frequent micturition and (3) slight twitching of limbs but this quickly passed off and the wounds healed rapidly

(I) The earth was made up into a liquid mud with which small squares of lint were infected which were introduced under the skin and at various periods of time afterwards the carbolic paste was introduced

(*a*) Control Died in seventy two hours extensive haemorrhagic oedema and gangrene *B aerogenes capsulatus* isolated

(*b*) Thirty per cent carbolic acid paste introduced into the wound *immediately* after the lint was put in Died of tetanus on the fourth day No marked local disturbance

(*c*) Thirty per cent carbolic paste introduced *fifteen minutes* after infection Died in seventy two hours No abscess or pus slight oedema Obtained *B aerogenes capsulatus* on cultivation in smear both *B aerogenes capsulatus* and *B tetanus*

(*d*) Thirty per cent carbolic paste introduced *thirty minutes* after infection Died of tetanus on eighth day Tetanus bacillus found in the wound but no *B aerogenes capsulatus*

(II) 0·25 grm of earth was placed in a gelatine capsule and introduced into a subcutaneous wound This was done in order to avoid infection of the skin, and the gelatine capsule dissolves and liberates the earth almost at once

(*a*) Control Animal died with diffuse haemorrhagic oedema in thirty six hours

(*b*) Thirty per cent carbolic acid paste introduced *five minutes* after infection Died of acute haemorrhagic oedema in forty eight hours

(*c*) Thirty per cent carbolic acid paste introduced *five minutes* after infection Four hours later 200 units of antitetanus serum were injected After forty eight hours the wound was swabbed out with 1 in 20 carbolic lotion and this was done every day afterwards Recovered

(*d*) Thirty per cent carbolic acid paste introduced *fifteen minutes*

after infection [illegible] forty-eight hours with spreading œdema *B. aerogenes* [illegible] and *B. tetani* found in serum

(e) Thirty per cent carbolic acid paste introduced *fifteen minutes* after injection Four hours later 200 units of antitetanus serum After forty-eight hours wound swabbed out with peroxide of hydrogen Died on fourth day Hæmorrhagic œdema *B. aerogenes capsulatus* cultivated

It will be noted that the only animal which recovered was one in which antitetanus serum had also been administered and the wound cleaned out after forty-eight hours In the first set of experiments it looked as if the gangrenous process had been stopped, but the second series does not confirm this idea

Observations on Man

Up to the present we have had very few opportunities of making observations on men. There have been no naval wounded for several weeks and dockyard and ship accidents have been much fewer than they were Two cases have been mentioned in the *Lancet* for February 27 p 429 One was a compound wound of the interphalangeal joint of the thumb It was a machinery accident with much soiling of the wound A 20 per cent carbolic acid paste was at once squeezed into the wound from a paint tube, and from time to time some more was applied on the surface The interesting point of this case was that although the skin had never been cleaned up or the wound cleaned out, and although practically the entire terminal phalanx was dead, yet for ten days there was no local or general disturbance and no fever no pain swelling or suppuration On the tenth day the surgeon cleaned it out and applied ordinary dressings Two days later sepsis appeared with suppuration up the tendon sheath, just what ought to have been present ten days earlier

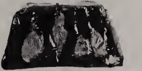
Another case was an accidental pistol wound of the buttock with fairly large entrance and exit openings Carbolic acid paste (20 per cent) was freely introduced and no inflammation occurred along the track of the wound, and ultimately there was only a small granulating sore at one of the openings, which healed in a few days

A third case was a bad scalp wound with denuded bone which was filled up with a 20 per cent carbolic acid paste Here also there was no disturbance and after ten days the small sore which remained was dressed with weak boracic ointment.

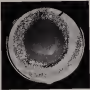
Tests have been made as to the effect of these pastes on the skin A 40 per cent carbolic acid paste causes a little redness and slight swelling of the skin after twenty-four hours but a 20 per cent strength does not seem to affect the skin In the cases above referred to no irritation of the skin was produced

Cresylic Acid (Cresol)

This is a product of distillation of coal tar, and consists of three isomeric bodies ortho-, meta- and para-cresol, which have nearly the same boiling point, hence the German name Trikresol Impure carbolic acid contains cresol, and it is the active agent in various proprietary substances which are a good deal employed in surgical practice Cresol is said to be more active than carbolic acid but less irritating and less poisonous It seems doubtful, however, if there is any marked difference between the two



20 per



We have worked with the redistilled ortho, meta and para-cresol obtained from Mr Martindale, and have also tested some of the proprietary substances. We have tested carbolic acid and cresol side by side and it is difficult to find any definite difference between them as regards diffusibility or antiseptic action. If anything it seems to us that cresol is rather more active than carbolic acid, the clear area seems to be rather larger and the area in which death occurs slightly greater. All the points which have been tested with carbolic acid have also been tested at the same time with cresol, both with agar and with blood clot, and seeing that the results are practically identical it does not seem necessary to repeat what has already been said.

We have, however, attempted to imitate the conditions of a wound, and fig 11 illustrates one of these experiments. A large block of blood clot was placed in a glass vessel and by means of a syringe four small collections of the 20 per cent cresol paste were introduced into the substance of the clot, about ½ in apart. The vessel was covered over and placed in an incubator for some days. At the end of a week the clot remained solid and still unaltered, and a section was made through the middle of it. The figure represents the appearance of the cut surface of the section. The four pieces of paste are seen with the tracks of the syringe and the solidity of the clot is apparent. Microscopical examination and cultivation from various parts of the cut surface failed to show any bacteria.

Figs 12 and 13 show the extent of the clear circle with cresol, 20 per cent and 30 per cent respectively.

We may, however, record the results of the experiments on animals.

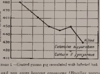


CHART I —Control guinea pig inoculated with infected lint

A.—*Cresol and non spore bearing organisms (Bacillus pyocyaneus and Streptococcus pyogenes)*

Series I—(1) Control. Small square of lint soaked in a strong emulsion of these organisms and placed under the skin of the shoulder. Severe suppuration, animal killed in seven days. *B pyocyaneus* present in the wound. (Chart I gives the variations in weight.)

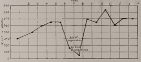


Chart 2. Guinea pig inoculated with infected hut, and 30 per cent cresol paste applied at once

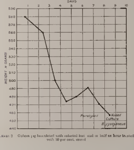


Chart 3. Guinea pig inoculated with infected hut and in half an hour treated with 30 per cent. cresol

(2) Cresol paste (30 per cent) introduced into wound immediately after infection with lint as in control Wound stitched up No suppuration for four days and the animal gained weight, then began to lose weight, and slight suppuration occurred Wound opened and cleaned out and lint removed Rapidly recovered *B pyocyaneus* found in the wound (Chart 2 gives the variations in weight)

(3) Cresol paste (30 per cent) introduced *fifteen minutes* after infection Almost continuous gain in weight no suppuration for four days Recovered *B pyocyaneus* not found in wound

(4) Cresol paste (30 per cent) introduced *half an hour* after infection Rapid loss of weight suppuration and necrosis Animal killed *B pyocyaneus* found (Chart 3 gives the variations in weight)

Series II—The *B pyocyaneus* and *Staphylococcus pyogenes aureus*, instead of being introduced on a piece of lint, were made into a paste with starch and placed in a small gelatine capsule the main object being not to soil the skin and cellular tissue except at the seat of experiment

(1) Control Suppuration and secondary abscess in neck Killed

(2) Cresol paste (20 per cent) introduced *immediately* after infection No suppuration or sloughing but small sore at seat of opening took some time to heal Recovered

(3) Cresol paste (20 per cent) applied *five minutes* after infection No suppuration small sore at line of incision No *B pyocyaneus* found Recovered

(4) Cresol paste (30 per cent) applied fifteen minutes after infection No suppuration small dry sore No *B pyocyaneus* found Recovered

Hence the results with the non spore bearing organisms are quite good up to fifteen minutes after infection

B—*Experiments with cresol paste and spore bearing organisms (tetanus and spreading gangrene) in earth*

Series I—See carbolic acid (B I) (1) Control Lint dipped in the mud containing *B tetanus* and *B aerogenes capsulatus* introduced under skin Died in seventy two hours. Extensive hæmorrhagic œdema and gangrene

(2) Cresol paste (30 per cent) introduced *at once* after inoculation Died of tetanus on fourth day No suppuration slight œdema

(3) Cresol paste (30 per cent) introduced *fifteen minutes* after infection (the lint with the greater part of the mud had apparently escaped from the wound in the interval between the infection and the introduction of the paste) Recovered without any bad symptoms

(4) Cresol paste (30 per cent) introduced *thirty minutes* after infection (here the lint fell out when putting in the cresol) Recovered

(5) Cresol paste mixed with earth (0 2 grm) and introduced into the wounds Animal recovered

Series II (1) Control 0·25 grm of earth placed in a gelatine capsule and introduced into the subcutaneous wound (see Carbolic acid) Died with diffuse hæmorrhagic œdema in thirty six hours

(2) Cresol paste (30 per cent) introduced *fifteen minutes* after infection Animal died of hæmorrhagic œdema in forty eight hours

(3) Cresol paste (30 per cent) introduced *fifteen minutes* after infection and then antitetanic serum four hours later After twenty

foot—bone wound swabbed out with 1 in 20 carbolic acid and then treated with more paste. Recovered.

The object of this last procedure is to do what is proposed in wounds. If cresol were used alone the idea would be, on the reception of the wound, to introduce the paste, then as soon as possible give a dose of antitetanus serum, and on arrival at the base clean out the wound and introduce more paste. Looking at the carbolic and cresol cases together this seems to have been successful except in one case.

As regards the two which recovered without serum, in both cases the piece of boot had fallen out from a quarter to half an hour after injection. Here, however, a quantity of mud was left behind in the wound, and either the dose of bacteria was too small or else the growth of the bacteria had been arrested, probably the former.

Observations on Man

On the skin cresol is rather more irritating than carbolic acid. As to the action of the paste in wounds we have had only one really test case, that of a man who shot himself in the face and head, the bullet entered just in front of the mastoid process and ran upwards and forwards and came out at the inner side of the forehead near the middle line. In its course it broke up the upper jaw and the malar bone, passed through the eyeball tearing it to tatters and smashed up the lower and anterior walls of the frontal sinus. The fracture of the frontal bone extended into the nose, where also the dura mater was torn, but there were no cerebral symptoms at first. The remains of the eyeball were removed and also one small quite loose fragment of bone from the supra-orbital region. The 20 per cent. cresol paste was then freely introduced into the whole track and cavity of the wound. The patient lived four days and died of his intracranial injuries, but during that time there was no inflammation or sloughing or suppuration from the wounds; they were quite aseptic, and no bacteria could be found in pieces of blood clot examined on the second and third days. On the second day a cultivation was made from the end of the drainage tube where it projected beyond the wound and only six colonies of cocci were obtained. Naturally one would have expected some growth from that part, and it is surprising that it was so little. The patient developed symptoms of meningitis and died on the fourth day. On post-mortem examination suppurative meningitis was found, but there was no suppuration anywhere in the external wound where the paste had been introduced; indeed although it communicated with the tear in the dura mater the blood clot was lying in it without any decomposition.

In connexion with cresol we may refer to certain proprietary substances which are a good deal used by surgeons, and the chief active agent in which is cresol. These are Izal, Cyllin, Hycol, Pacolol and Lysol.

Izal.—The only test we have so far applied to this substance is the action of a 20 per cent. paste (lanolin and wax base) as contrasted with pastes of other antiseptics of similar strengths. The result is that no clear area is formed beyond the limit of the cover glass, in fact colonies are seen extending further inwards. Diameter of absolute clear area 20 mm. (see fig. 14).

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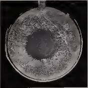
[illegible]



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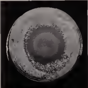
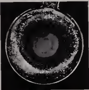


[illegible] (regular) 20 per cent [illegible] [illegible] and wax base.



[illegible]

[illegible] —In a 20 per cent paste there is a somewhat larger clear area [illegible] with a [illegible] isolated colonies formed up to the edge of the cover [illegible]. Diameter of absolute clear area = 24 mm (fig. 15)

Lysol.—The 20 per cent paste gives a large clear area with a diameter of about 37 mm (fig. 16)

British Lysol.—Made by Martindale with redistilled O.M.P. cresol (ortho-, meta- and para-cresol) gave a large clear area with a 20 per cent paste with diameter about 45 mm. (This British lysol contains 50 per cent O.M.P. cresol.) (See fig. 17.) Fig. 18 shows the result with British lysol pure on filter paper.

Hycol.—In a 20 per cent paste gives a clear area with a diameter of about 25 mm. As this was the first cresol preparation we tested we made further experiments with it. For example we compared a series of pastes of different strengths with carbolic acid as regards their power of killing bacteria on the surface of the agar block. These plates, prepared with pastes of 5 per cent, 10 per cent, 15 per cent, and 20 per cent of each, were tested at the end of twenty-four hours as to the vitality of the bacteria in the centre with the following result (*Staphylococcus pyogenes aureus* being used):—

	5 per cent	10 per cent	15 per cent	20 per cent
Carbolic acid	+			−
Hycol	+	+	+	

An experiment with blood clot painted with *B. coli communis* (part of experiment with carbolic acid, p. 117) gave the following result:—

Hycol, 5 per cent.—Clot diffluent, stinking and full of bacteria.

Hycol, 10 per cent.—The same.

Hycol, 15 per cent.—Clot not so decomposed, but full of organisms.

Hycol, 20 per cent.—Small clear centre but plentiful growth around. Microscopically some bacilli but chiefly cocci in large numbers. Growth on cultivation from centre.

If again Experiment I with carbolic acid (p. 117) is referred to, other antiseptics were tested at the same time and in the same manner and the result with hycol 15 per cent. was considerable decomposition of the blood which was semi-liquid and contained bacilli and cocci in large numbers.

With hycol (20 per cent.) the clot remained solid and was not smelling but bacilli and cocci were growing on it.

Lastly in Experiment II with carbolic acid (p. 117) hycol was tested in 15 per cent. and 20 per cent. strength, but though there was no putridity and the clot remained fairly firm, especially the 20 per cent. one, there was plentiful growth of cocci on the surface.

The same firm has on the market another preparation termed *Pacolol*, which was also tested at the same time.

In Experiment I (see above) a 5 per cent. pacolol did not interfere with the decomposition of the blood and the growth of bacteria nor did

the undiluted pacolol itself and the same was the result with a 5 per cent pacolol in Experiment II

With the exception of the [illegible] made by Martindale with redistilled cresol none of these preparations are so satisfactory as the pure cresol or carbolic acid

IODINE

Experiments with Agar—Iodine in the lanolin and wax base in the proportions of 2 per cent 4 per cent and 6 per cent did not interfere with growth on the surface of the agar slab at all As each of these strengths caused redness and irritation of the skin if kept on for twenty four hours and as a 10 per cent paste actually caused necrosis of the skin after two and a half hours application we did not consider it necessary to make any stronger pastes It is curious to note in the 6 per cent paste (fig 19) that the organisms are growing more copiously over the iodine than elsewhere although this is the highest portion of the slab

Thinking that the addition of iodide of potassium might help the diffusion of the iodine a fresh paste was prepared with 2 per cent iodine and 3 per cent iodide of potassium, but the bacteria grew on the surface as freely as before A 3 per cent potassium iodide paste alone does not interfere with growth Tinct iodi (*B P*) was dropped on filter paper in a paraffin cell, but it also did not inhibit growth The colonies were somewhat sparser over the actual central part but there was no real inhibition There was no discoloration of starch on the surface of a plate under the tinct iodi

Inoculation of tubes from the centre of a 6 per cent plate six days after its preparation gave copious growth

Experiments with Blood—In blood iodine is also equally inert In one experiment carbolic acid 20 per cent cresol 20 per cent and iodine 6 per cent in pastes were placed behind discs of blood ¼ in in thickness and the surface of the disc was brushed over with a culture of *S pyogenes aureus* While the two former checked growth and prevented decomposition and diffluence of the blood growth occurred freely in the iodine vessel and the clot broke down and became diffluent In another experiment blotting paper was saturated with a 2½ per cent iodine solution and placed in a cell behind a disc of blood clot the surface of which was painted with *B coli communis* the clot became stinking and diffluent

No experiments have been made on animals, because iodine was being extensively used at the Front The application causes great pain and it seems amply proved that it does not disinfect the wounds indeed many of the wounds which have been treated with iodine are among the most septic which we meet with It is quite clear from all these facts that iodine is useless for the disinfection of wounds in war or for inhibiting the growth of bacteria in wounds

DOUBLE CYANIDE OF MERCURY AND ZINC

This salt was introduced into surgical practice by Lord Lister, in 1889 and was the subject of several very interesting communications by him It is a peculiar substance and does not seem to be always quite constant, while it may contain some free salt especially a mercurial salt which may cause a good deal of irritation Lister states that when quite pure it

PLATE [illegible]

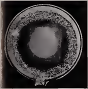


Fig. 18.—[illegible]

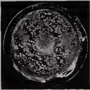


Fig. 19.—[illegible]

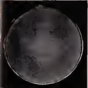


Fig. 20.—Double [illegible] water [illegible]

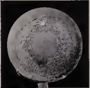


Fig. [illegible].—Saberh [illegible] 20 per cent. [illegible] wax base.

is insoluble in water, but soluble in 1—3,000 parts of blood serum [illegible] that it does not irritate the skin. Of late, however, with the specim[illegible] of this salt supplied to us we have been able to dissolve a certain amo[illegible] of strongly antiseptic salt from the powder in water and some sampl[illegible] of cyanide gauze which we have come across of late cause mark[illegible] irritation of the skin in a manner of which we have had no prev[illegible] experience; and one cannot help thinking that possibly some alterat[illegible] has been made in the process of manufacture of late, which leaves [illegible] certain amount of soluble salt mixed with the double cyanide and th[illegible] this is irritating to the skin and may also be poisonous.

Experiments with Agar.—The powder of the double cyanide [illegible] into a 10 per cent. paste with the lanolin and wax base and an agar plat[illegible] prepared in the usual manner. Free growth occurred though [illegible] colonies over the centre were not quite so numerous as else[illegible] when [illegible] the other hand when the powder was mixed with a little water and pla[illegible] in a paraffin cell no growth occurred anywhere over the agar [illegible] (see fig. 20). This last experiment was repeated several times [illegible] with the same result; in one plate there was a very narrow lin[illegible] small colonies quite at the outside of the plate but the others shewe[illegible] growth at all.

This result was very surprising. It is difficult to understand how a powder which is said to be practically insoluble in water could [illegible] over a disc of agar 3 in. in diameter and ½ in. thick and also exert [illegible] only an inhibitory but also an antiseptic action, for examination of [illegible] surface of the plate showed that the bacteria towards the centre wer[illegible] killed. Either the combination had become dissociated and we had the cyanide of mercury and the cyanide of zinc separate or some free salt (? cyanide of mercury) has been left in the powder during its prepara-tion, &c. Lister speaks of a free soluble salt being sometimes present in the double cyanide which irritates the skin.

We tested rosaline, the colouring matter used in the cyanide gauze and we found that it gave a clear space 3·5 mm. in extent, so that it is itself an inhibitory and antiseptic agent.

We have washed the powder of the double cyanide in several changes of water and dried the powder again. It still inhibited all growth on the plate.

On leaving some water over the cyanide powder and then filtering it we found that the water in the proportion of one part to three parts of nutrient broth prevented growth of staphylococci so that it evidently had dissolved out some substance which was antiseptic. This water showed the presence of a mercurial salt.

Cyanide of mercury is a powerful antiseptic and plates prepared with this substance shewed no growth just like the ones with the double cyanide. Cyanide of zinc and cyanide of lead also give the same result but cyanide of lead leaves a narrow margin of growth.

Experiments with Blood.—A stoppered bottle was half filled with blood clot and a quantity of double cyanide powder which had been washed in several changes of water was mixed up with it. The clot remained firm and did not undergo putrefaction. Some double cyanide powder was placed beneath a disc of blood clot which was inoculated on the surface with *B. coli communis*. Small clear centre, marked growth and lique-faction and putrid smell at the margin.

Cyanide paste which had been kept in a lead tube for some time and had corroded the lead and probably formed cyanide of lead placed under a disc of blood-clot which was inoculated with *B coli communis* gave a clear centre of an inch in diameter but marked growth at the margin

Experiments on Guinea pigs—(1) Lint infected with very virulent mud (full of *B tetanus* and *B aerogenes capsulatus*) introduced into a wound and double cyanide paste five minutes later Died in forty eight hours symptoms of tetanus *B aerogenes capsulatus* obtained from serum (2) 0 4 gm earth in capsule and cyanide paste fifteen minutes later very ill after two hours and died in forty hours No marked inflammation or oedema no *B aerogenes capsulatus* obtained from near the wound (3) Similar experiment very ill from first slight oedema round wound, ... paresis Died in fifty six hours *B aerogenes capsulatus* obtained from wound (4) Similar experiment + anti tetanic serum in fourteen hours Died in eighteen hours Ill soon after inoculation, never ate or moved No oedema No *B aerogenes capsulatus* found

The impression which we obtained from these experiments was that the death of the animals was due to poisoning rather than to tetanus or the gangrenous process and till we have got a little more light on the chemistry of the substance we should hesitate to leave any considerable amount of this salt in a wound

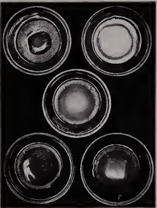
Salicylic Acid and Salicylates

Salicylic acid was introduced in the treatment of wounds by Professor Thiersch of Leipzig about forty years ago, and extensively used for some time It was the most successful substitute for carbolic acid at that time but was gradually given up as the results obtained were not so good as with carbolic acid It was used in the form of lotions, cream, ointment gauze and wool, and up to the present time some surgeons employ salicylic wool as an outside dressing to reinforce the antiseptic gauze especially if there is likely to be much oozing of blood or serum At one time a salicylic cream was much used by Lister for applying on the skin around the wound where a dressing was to be left on for some days It seemed to prevent the irritation of the carbolic dressings and also the growth of bacteria on the surface of the skin and thus spread into wounds This cream was made by mixing salicylic acid powder with glycerine (containing ... of carbolic acid) till a suitable consistence was obtained

In the Russo Japanese War the Japanese used a powder of salicylic acid and borax with which they dusted the wounds as soon as possible after their infliction, and they regarded this method with favour Some time ago Fleet Surgeon Gaskell who is in medical charge of the Naval Division arranged when preparing the medical outfit of that division to include in the first field dressing packets a dredger containing a powder of borax and salicylic acid in equal parts with which to dust the wounds

Salicylic acid is soluble in 1 in 550 parts of cold water in 1 in 11 parts of alcohol (60 per cent) and in 1 in 14 parts of glycerine and its solubility in water is much increased by the addition of borax Twenty grains of salicylic acid are rendered soluble in 1 oz of water by the addition of 25 gr of borax We have found that its activity as an antiseptic is increased by the use of boric acid and from our experience

PLATE XIII



we prefer this to borax We have termed the mixture of boric and salicylic acids "borsal" for the sake of shortness

Experiments with Nutrient Agar —Salicylic acid (20 per cent) in the lanolin and wax gives a small clear area about 24 mm in diameter (see fig 21). When compared with its action in the gum tragacanth base this is quite insignificant, and we have not therefore done any more work with the lanolin and wax base

Salicylic acid in a gum tragacanth base (salicylic acid 40 parts, gum tragacanth 2 parts, glycerine 29 parts, water 29 parts) gives a clear area 44 mm in diameter (see fig 22)

We have done a considerable number of experiments with salicylic acid and boric acid (borsal) in various proportions in the gum tragacanth base above mentioned the total quantity of powder being in all cases 40 per cent The clear area is large in all cases (averaging 58 mm in diameter) and practically of the same extent although the proportions of the two substances varies (see figs 23, 24 and 25) Boric acid alone in the gum tragacanth base gives a clear area 44 mm in diameter (see fig 26) Salicylic and borax in equal parts in the same base gives a clear area 66 mm in diameter (see fig 27) Borax alone under the same conditions gives a clear area of 46 mm (see fig 28)

The following table shows the action of the above substances in the gum tragacanth base as regards inhibition —

	Clear area (i e inhibition) in mm
Salicylic acid	44 mm
Boric acid	57 mm
Borax	46 mm
Borsal	58 mm
Salicylic acid and borax	66 mm

Still more important than the inhibition is the question of the death of the bacteria We have tested borsal at various intervals during the first twenty four hours by the trident method already described and the others have been tested at the end of twenty four hours

The following table shows the result as regards borsal at various intervals during the first twenty four hours —

Areas	1	2	3	4	5	1*
After 2 hours	–	–	+	+	+	+
4	–	–	+	+	+	+
6		–	–	+		+
8					+	+
10	–	–	–		+	+
24					+	+

* See card (fig 7) Retarded growth

The next table gives the result in the following cases at the end of twenty four hours —

Areas	1	2	3	4	5	
Borsal					–	
Boric acid		–	–	+	–	
Borax	+	–	+	–	–	
Salicylic acid and borax (equal parts)				+		

See fig 49 — See fig 50

As regards salicylates the following were tested in 20 per cent strengths in the gum tragacanth base, slightly more gum being used to give sufficient solidity

Salicylate of quinine	Inhibition area 39 mm	
„ soda	„ „ 58 „	(fig. 11)
„ ammonia	„ „ 36	(fig. 12)

With none of these substances were the organisms killed at the end of twenty four hours even at the centre

It is interesting to note that on the salicylate of quinine plate *Aspergillus niger* grew on the clear area after several days, although there was no extension of the staphylococcus growth

Experiments with Blood — When mixed with blood salicylic acid causes the dark blood clot to become red Placed under a slab in the manner already described the salicylic tragacanth paste gave a clear area corresponding to the extent of the paste, and the surface was sterile after twenty four hours A thick cake of blood was injected with the paste in various places (see carbolic and cresol experiments) and remained sweet for several days It did not become hard as it does with the carbolic acid

Experiments on Guinea Pigs

I —*Experiments with Bacillus pyocyaneus and Staphylococcus pyogenes aureus to test local suppuration, a powder of equal parts of salicylic acid and boric acid being used*

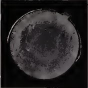
1 —

(1) Control Cultivation mixed with starch and put in a capsule Slight supperation *B pyocyaneus* obtained from the wound on the fourth day Recovered

(2) Bacteria introduced in capsule, and then five minutes afterwards a quantity of the borsal powder introduced into the wound No suppuration Slight loss of weight Recovered

(3) Infection as above five minutes later the powder introduced and half an hour later some 20 per cent cresol paste squeezed in No supperation small local sore Recovered

The last experiment was founded on the directions which it was pro



posed to give for use in the field viz first to powder the wound with the borsal powder, and later to inject the paste (lysol, cresol, &c)

B —*Bacillus pyocyaneus and Staphylococcus pyogenes aureus introduced in a capsule*

(1) Control The bacteria introduced alone into a wound behind the shoulder Suppuration and secondary abscess in neck Killed

(2) Capsule introduced Borsal powder applied at once Marked diarrhœa, which, however, only lasted for twenty four hours and loss of weight No suppuration or local trouble Recovered

(3) Capsule introduced Borsal powder applied at once and cresol paste in fifteen minutes No suppuration or loss of weight Small dry sore at seat of incision Recovered

II —*Experiments with earth rich in tetanus bacilli and Bacillus aerogenes capsulatus*

A —*Experiments with equal parts of salicylic acid and boric acid (borsal powder)*

(1) Control Earth (0 2 grm) rubbed in Died in thirty six hours with rapid hæmorrhagic œdema *B aerogenes capsulatus* recovered from the fluid in connexion with the subcutaneous hæmorrhage Died

(2) Earth in capsule (0 2 grm) and five minutes later borsal powder introduced Beyond small local dry sore, which formed on the fourth day there were no local ill effects and no loss of weight

(3) Earth rubbed in (0 2 grm) five minutes later borsal powder introduced Wound dried up No festering No loss of weight Recovered

(4) Earth rubbed in (0 2 grm), five minutes later borsal powder introduced Wound dried up Recovered

(5) (Experiment on another day) Earth (0 2 grm) rubbed in borsal powder five minutes later Recovered

(6) Earth (0 2 grm) in capsule and 0 3 grm borsal powder in five minutes Died fourth day Diffuse hæmorrhagic œdema, and also tetanic symptoms *B aerogenes capsulatus* and *B tetanus* recovered from the wound

(7) The same method and quantity Died fourth day Exactly same result

(8) Earth (0 2 grm) was mixed with the borsal powder (0 2 grm) and the mixture was then introduced into a subcutaneous wound Recovered

B —*Experiments with salicylic acid and boric acids equal parts (paste in water and gum)*

(1) Earth (0 2 grm) in capsule and borsal paste after fifteen minutes No loss in weight Died fourth day Diffuse œdema and tetanic symptoms

(2) The same Recovered

Series with earth *rubbed into* the wound and borsal paste in gum, glycerine and water

(1) Control Earth (0 2 grm) rubbed in Died in thirty hours *B aerogenes capsulatus* infection (Chart 4 shows the rapid loss of weight)

(2) Earth (0 2 grm) rubbed in, then borsal paste five minutes later Died in three days *B aerogenes capsulatus* infection

(3) Earth (0 2 grm) rubbed in then borsal paste five minutes later Lost weight at first, then gained Died of tetanus on the eighth day *Wound healed*

(4) Earth (0 2 grm) rubbed in borsal paste fifteen minutes later Died third day *B aerogenes capsulatus* infection

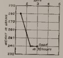


CHART 4 Control 0·2 grm earth rubbed in Death in thirty hours

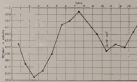


CHART 5 —Guinea pig inoculated with 0 2 grm of infected earth in capsule Borsal powder in five minutes cresol paste in half an hour

(5) The same. Died third day *B aerogenes capsulatus* infection

(6) Earth (0 2 grm) rubbed in, borsal paste thirty minutes later Died in thirty six hours *B aerogenes capsulatus* infection

(7) Earth (0 2 grm) rubbed in fifteen minutes later salicylic and boric paste in proportion of 1 to 3 Died

Salicylic acid (30 per cent in lanoline). Earth (0·2 grm.) rubbed in; fifteen minutes later salicylic paste in lanoline. Died on fourth day, acute spreading gangrene.

Salicylic and boric powder (equal parts) followed by cresol paste.
(1) Earth (0·25 grm.) rubbed in, borsal powder at once, then cresol paste in fifteen minutes. Recovered.
(2) Earth (0·2 grm.) rubbed in, the borsal powder in five minutes and then cresol paste in fifteen minutes. Recovered.
(3) Earth (0·2 grm.) in capsule, borsal powder in five minutes, then cresol paste in thirty minutes. Recovered. (Chart 5 shows the variations in weight.)
(4) Earth (0·2 grm.) in capsule, borsal powder in fifteen minutes and cresol paste in thirty minutes. Recovered.

The above methods with the addition of antitetanus serum.
(1) Earth (0·2 grm.) rubbed in, borsal powder in fifteen minutes, antitetanus serum in four hours. Recovered. (Chart 6 shows the variations in weight.)

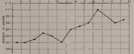


CHART 6.—Guinea-pig inoculated with 0·2 grm. of infected earth rubbed into wound and borsal used also. Borsal in fifteen minutes, antitetanus serum in four hours.

(2) Earth (0·2 grm.) rubbed in, borsal powder in thirty minutes, antitetanus serum in four hours. Recovered.
(3) Earth (0·2 grm.) in capsule, borsal powder (0·3 grm.) in fifteen minutes, antitetanus serum in twenty hours. Died fourth day. Acute hæmorrhagic œdema. *B. aerogenes capsulatus* and *B. tetanus* both recovered from wound.
(4) Earth (0·2 grm.) in capsule, borsal paste in fifteen minutes, antitetanus serum in fourteen hours. Recovered.
(5) Earth (0·2 grm.) rubbed in, borsal paste in thirty minutes, antitetanus serum in four hours. Recovered.
(6) Earth (0·2 grm.) rubbed in, borsal powder at once, 20 per cent. cresol paste in fifteen minutes, antitetanus serum after four hours. Recovered.

The following table shows the results:—

[illegible]	Weight	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Anti-toxic serum [illegible]	Result	Remarks. B T – Tetanus bacillus. B A C – *Bacillus aerogenes capsulatus*
1	49[illegible]	0 2 gm				Control			Died	Death after thirty six hours, acute hæmorrhagic œdema B A C present
2	466	0 [illegible]				[illegible] min			Recovered	
3	335	0 2							"	
4	420	0 2		+		"				
5	845	0 [illegible]		+ 0 1 gm		15			Died	Death on fourth day B T and B A C in wound
6	495	0 2		0 1 gm		15				Death on fourth day B T and B A C recovered from wound
7	110	0 2	+			[illegible]			Recovered	
8	31[illegible]	0 2				At once	+ 30 per cent after 15 min		"	
9	210	0 25				[illegible]	+ 30 per cent after 15 min			
10	645	0 2				"	+ 30 per cent after 30 min			

11 [illegible]	[illegible]	1½	+ 30 per cent after 30 min			
12 [illegible]	[illegible]	At once	+ 30 per cent after 15 min	+ 200 units after 4 hours		
13 [illegible]	[illegible]	15 min		+ 200 units after 4 hours		
14 [illegible]	[illegible]	30		+ 200 units after 14 hours		
15 [illegible]	[illegible]	1		+ 200 units after 20 hours	Died	Death on fourth day with diffuse œdema and tetanus B T and B A C recovered from wound
16 [illegible]		1		+ 200 units in 14 hours	Recovered	
17 [illegible]		1½			Died	Death on fourth day diffuse œdema and tetanus
18 [illegible]		1½	—	—	Recovered	
19 [illegible]	[illegible]	1½			Died	Death on fourth day B T and B A C recovered

[illegible] 0 2 grm			Control		[illegible]	Death in thirty hours B A C infection
[illegible]			5 min			Death in three days B A C infection
[illegible]			[illegible]			Death from tetanus on eighth day the wound had healed
[illegible]		—	[illegible]			Death on third day B A C infection
[illegible]	+		[illegible]			Death on third day B A C infection
[illegible]			30			Death in thirty six hours B A C infection
[illegible]		+ 3 parts sal acid to 3 parts boric	5			
[illegible]	—	—	30	+ 200 units in 4 hours	Recovered	
[illegible]	Equal parts of earth (0 2 grm) and boracic powder mixed together and then introduced into wound					

An analyses of these cases shows several interesting points, of which we may mention the following

The total number of cases treated after infection with earth highly charged with *B. tetanus* and *B. aerogenes capsulatus* was 25 and of these 14 recovered

Of these 14 recoveries, 5 were treated with borsal alone 4 were treated with borsal and 30 per cent cresol paste 4 were treated with borsal and antitetanus serum, 1 was treated with borsal and cresol and antitetanus serum

In 15 cases borsal alone was used of these 5 recovered In these cases the borsal was introduced into the wound in the form of powder in 6 cases, of which 4 recovered and in the form of paste with gum tragacanth or lanolin in 9 cases, of which only 1 recovered The explanation of this is not quite clear It may be that the salicylic acid acts better dry, forming a stronger and more active solution when it dissolves in the fluids in the wound but it must also be remembered that a very much smaller quantity is introduced in the form of the paste than in the form of the powder (20 per cent of salicylic acid in the paste as compared with 50 per cent of the acid in the powder) In these experiments as much powder was used as could be introduced into the wound except in three cases where the amount was limited to 0 3 grm (one and a half times the weight of the earth) All those three cases with the limited amount of salicylic acid died, one of them in spite of the use of antitetanus serum at the same time. This raises a very difficult question of the amount of antiseptic necessary relative to the amount of infection, but we have not so far gone into that It also raises the question which arises in all this work viz how much antiseptic can be put into, and left in, a wound in man

The further experiments show that the borsal may be reinforced by subsequent injection of cresol paste for of five cases in which this was done all recovered (one of them being combined also with antitetanus serum) It may also be reinforced by the use of antitetanus serum for of six cases in which this was done only one died, and in that case the serum was not administered till twenty hours after infection

The interesting and important point at the moment with regard to this drug is that in guinea pigs which are very susceptible to this infection a certain number of animals recover completely after massive doses of bacteria by the introduction of borsal into the wounds soon afterwards fortified by the use of cresol paste or antitetanus serum or probably better, of both

One other point which clearly stands out is that the use of these antiseptics does not make matters worse and favour the spread of the infection on the contrary, even if it does not stop it, it delays it If one looks at the table the control animals died in from thirty to thirty six hours whereas none of the treated animals died earlier than the third day and in one case the animal did not die of tetanus till the eighth day and in the meantime the wound had healed

We have had a patient seen sixty hours after being wounded in the soft parts of the thigh with a bullet and also with a shrapnel bullet The wounds had been treated at the Front with methylated spirit and

then swabbed out with [illegible]. The shrapnel wound was foul smelling and highly [illegible] pus and [illegible], the skin around was red and the parts brawny. This wound was laid freely open, dried and powdered thoroughly with boracic and subsequently filled up with cresol paste. When dressed next day there was no odour and very little discharge, and the brawny condition had markedly subsided. A part of the bullet track however, which had not been treated was brawny and septic and then more powder and paste were introduced. The wound healed rapidly. *B tetanus* and *B aerogenes capsulatus* were found in it when first seen.

OTHER ANTISEPTICS

Various other antiseptics have been tested as to diffusion in agar, but we have not yet had time to study them more fully.

Paraform 5 per cent in lanolin and wax base (fig 33). This gives a good clear area 43 mm in diameter. Immediately outside this area the colonies are large.

Bichloride of mercury, 0 2 per cent in lanolin and wax base. Here there is a clear area about 36 mm in diameter. The colonies are also large right up to the edge of the clear area (see fig 34).

Oil of turpentine, 20 per cent in lanolin and wax base. No inhibition free growth of colonies all over the plate (fig 35).

Oil of eucalyptus 20 per cent in lanolin and wax base. No inhibition Growth all over (fig 36).

Various essential oils

Oil of origanum 20 per cent in lanolin and wax base. Centre clear, but in the immediate neighbourhood there are isolated colonies (see fig 37). Diameter of complete inhibition area 25 mm.

Oil of cinnamon (bark). Good inhibition. Diameter of area of clear inhibition 46 mm (see fig 38).

Cinnamic aldehyde. Diameter of inhibition, 46 mm.

Oil of cloves. Diameter of inhibition 30 mm.

Friars' balsam (piece of filter paper soaked with this balsam and placed in paraffin cell). No inhibition free growth.

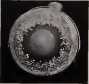
Balsam of Peru (filter paper as above). Good clear circle. Diameter of inhibition area 37 mm (see fig 39).

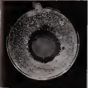
Dr Menciere's embalming solution (see *Lancet*). No inhibition free growth.

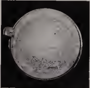
Colloidal mercury selenium, copper and silver. No inhibition with any of them free growth.

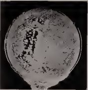
We are at present engaged in investigating preparations of Peroxide of Hydrogen at Sir William Ramsay's request, which seem most promising and will be reported on in due course.

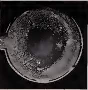
Although this is only a preliminary report the results so far as we have gone are most encouraging and already it seems worth while to apply the method to wounds in war. That certain substances would diffuse through blood tissues and agar was of course known, but in what way this diffusion takes place and how anti-

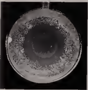












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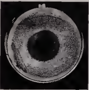

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septics act in relation to the growth of bacteria at a distance had not been worked out We find that quite a number of substances can diffuse through a considerable thickness of material, and influence the growth of the bacteria which they may meet with in their course The radius within which they act seems to depend to a considerable extent on the concentration and the quantity of the antiseptic at the site from which it radiates, on the base with which it is combined, and on the extent of surface to which it is applied Assuming that radiation takes place in all directions from the centre, naturally the further away from that centre, the more dilute will be the antiseptic substance Hence the action is most marked at the point nearest the centre For example, with a disc of agar ¼ in thick placed over an antiseptic paste the earliest and most potent effect on the growth of bacteria on the surface of that disc is seen at the very centre As we pass away from that point, the action becomes weaker and less certain till a point is reached where the antiseptic is unable to interfere with growth at all Before that point is reached, there are areas in which varying effects are observed according to the time that the antiseptic has taken to diffuse in sufficient quantity to produce an effect on growth Antiseptics vary considerably in their rate of diffusion and naturally also in the quantity which passes through a certain distance in a given time The clear area which is seen in a number of these preparations indicates inhibition of growth, and the amount necessary to produce that effect must have passed through at the latest in two hours Hence we have a means of estimating the rapidity of diffusion and the power of inhibition of various antiseptics, but that area does not indicate the limit of ultimate diffusion, but only the amount, sufficient to inhibit growth which passes through in a given time For example if a plate is made with picric acid the whole plate will soon become yellow showing that the acid has diffused over a large area, but there will only be a small, clear circle, quite at the centre, showing that only at that point had the picric acid come through in sufficient quantity to prevent the growth of the bacteria on the surface before they had time to form colonies Even after three hours some antiseptics will continue to come through till a sufficient amount is present to arrest the growth of colonies which have already formed, but in the case of most of the active antiseptics the amount necessary to produce inhibition has already come through in an hour or two, and there is only slight extension of the area of restricted growth

afterwards Again, some antiseptics not only inhibit the growth, but also kill the bacteria while others may inhibit growth over a large area but do not kill the bacteria even after twenty-four hours In estimating the value of an antiseptic for our purpose we have to consider not only its power of inhibiting growth, but also its power of killing bacteria and there is a great difference between inhibition and destruction Some substances may inhibit over a large area, but do not kill at all, e g. borax while others, e g , salicylic acid, kill quite readily

Of the substances which we have tested boric and salicylic acids, cresol, and carbolic acid seem to be the most useful for our purpose it may, however quite well happen that others which we have not yet studied would do better In the meantime however, the substances which we have mentioned seem well worth testing in man on the principle that we have been investigating Cresol and carbolic acid have very considerable activity at a distance both as inhibitory and as destructive agents, and when combined in a wax and lanolin base, go on diffusing for a very considerable time The result is that they prevent the growth of bacteria over a considerable area, and are able also to destroy the ordinary pyogenic non-spore bearing bacteria over the greater part of that area The mixture of boric and salicylic acids is more potent in both directions, and, apparently, as evidenced by experiments on guinea-pigs, can prevent the action of spore-bearing organisms also In some ways, however this mixture of boric and salicylic acids is not so suitable as the others, especially in that it is not stored up in the same way but the combination of borsal powder with cresol or phenol pastes seems very efficacious in animals We are, therefore, of opinion that the time has come when this combination should be given a thorough trial in man

In our experimental work boric and salicylic acid have not acted so well in the form of pastes as in powder In a paste with lanolin and wax it does not diffuse at all well, and in the experiments on animals the paste with gum tragacanth, which diffuses very well in agar, did not act nearly so well as the powder But as we said at the beginning a powder is not so satisfactory as a paste in wounds in war, because it would be very difficult to apply it to the whole interior of the wound, and it would also be very apt to be carried away by the blood and be lost We therefore propose that borsal (salicylic acid and boric acid in equal parts) should be used as a powder and thickly dusted over the wounds as far as possible and that its action should be reinforced by the

injection of cresol paste (20 per cent in lanolin and wax base) into the interior of the wound in various directions. As a matter of fact the soiling of wounds with earth is not likely to extend to any great depth, and the borsal powdered over a wound, especially if it is well open and the bleeding has stopped, will probably overtake the severe earth infection, while the septic organisms carried on further will be dealt with by the cresol. At any rate the growth of organisms will be inhibited over a large area till the patient reaches the dressing station where the wound can be opened up and more thoroughly attended to. It would, of course, be much better if we could attain our object with a single antiseptic and we propose to make further experiments in the hope of attaining a satisfactory paste with salicylic acid, but in the meantime the combination which we suggest promises to be of considerable value in these cases.

It is proposed to issue this combination to the Navy[1] in the form of pepper pots containing about 1 oz. of borsal in each, and of paint tubes containing ½ oz. of 20 per cent. cresol paste, the tubes being provided with nozzles about 2 in. in length, which are screwed on the ends of the paint tubes, so that they can be introduced into the depths of the wound in various directions. This tube should only be used on one patient, and then thrown away. In the ships a sufficient quantity would be issued to deal with the probable number of wounded; in the case of Naval contingents acting on shore each man would have a pepper pot and a tube in his field dressing. In the case of a wound at the Front the first thing is, of course, to stay the bleeding as much as possible, and then to powder the whole surface thickly. The cresol tube is then introduced into the wound and small quantities of the contents are squeezed into it in various directions, endeavouring as far as possible to leave small portions of the paste scattered over the whole area of the wound, not more than 1 in. apart. Some of the paste should also be smeared over the skin around the wound, and after a final dusting with the borsal powder the emergency dressing is applied. This can all be done quite quickly, and then the patient can wait till such time as the wound can be more thoroughly attended to.

When the patient arrives at the advanced dressing station the treatment depends on circumstances.

(1) If a large number of wounded have to be attended to,

[1] These preparations are now issued by all the Royal Naval Hospitals, together with a memorandum of instructions.

patients who have been treated in the above manner can wait, unless a good many hours have elapsed since the injury In that case the orderlies should inject a little more paste into the wounds and powder them and apply a fresh antiseptic dressing while the patient waits his turn.

(2) If it is a large or complicated wound e g., a compound fracture it will be well in the first instance to clean and disinfect the skin, preferably with 1 in 20 carbolic lotion, then wash out the wound with peroxide of hydrogen and 1 in 20 carbolic lotion remove pieces of clothing or accessible pieces of shell clip away any badly soiled tags of tissue and arrest the bleeding The wound being dried and held open it can now be powdered with borsal and some cresol paste left in various parts of the wound If it is widely open it may be well to put a few interrupted sutures in to bring the edges somewhat together and prevent the escape of the antiseptic, and finally apply antiseptic dressings

(3) If it is not a large wound if the clot seems solid and if it has been well powdered and plenty of paste introduced into it in the first instance, it is quite possible that sepsis may not occur and if that seems likely all that need be done would be to squeeze a little fresh paste and dust some borsal powder over the surface and the skin around and apply a fresh antiseptic dressing

These wounds will probably not require further dressing till they arrive at the base hospital

Subsequent Treatment at the Base.—Should the wound be free from sepsis or inflammation on arrival at the base hospital it should not be opened up or syringed or otherwise interfered with Some fresh paste diluted if necessary, may be applied over the surface and the skin and a fresh antiseptic dressing put on

If on the other hand, there are signs of sepsis the wound must be opened up and drained, and otherwise treated according to the experience of the surgeon

REPORT ON THE CASUALTIES IN THE ACTION BETWEEN THE "PEGASUS" AND THE KONIGSBERG

By Staff Surgeon A. T. HEWITT, R.N.
Late of the "Pegasus"

As a result of this action, which took place at Zanzibar on the morning of September 20, 1914, 24 men of H.M.S. "Pegasus" and one native servant were killed, and 8 officers and 69 men wounded. Of the 3 officers and 25 men admitted to the European hospital, 2 officers and 4 men died the same day. Subsequently 5 more men died of their wounds.

After the action all the wounded were conveyed ashore to the European Hospital, situated on the sea front, and from there 38 were sent to the Native Hospital at Mnazi Mmoja, half a mile away, and 4 to University Mission Hospital at Mkunazini, about one mile from the European Hospital. The remainder were treated in camp at Ziwani.

The most remarkable feature of the wounds was the large number of minute superficial wounds and burns looking like the pitting of black powder; also the small penetrating power of the fragments in open spaces like the upper deck. The danger zone as far as life was concerned seems confined to a small area round the bursting space, and although the initial velocity of the fragments appears to be very great, this seems to rapidly diminish, perhaps owing to the irregularity of their shape.

A large number of fragments were removed from the wounds at a depth of from 2 in. to 4 in., some embedded in bone and some in the soft tissues. In the two penetrating wounds of the skull the entrance wounds were of identical shape and size to the shell fragments found, but in neither case did the missile penetrate more than 4 in. A bullet would certainly have penetrated much further.

A leading seaman had his right arm so shattered that a primary amputation was necessary, but a fragment of the same shell hit the brass buckle of his belt, breaking it, but not even bruising the abdomen.

Small fragments were also the cause of the loss of four eyes, and I am of opinion that a pair of motor goggles would have saved all these.

A case of aneurysmal varix occurred in the right common

carotid and jugular vessels cut off by a minute particle of shell which probably could have been stopped by a linen collar

In my opinion a coat of light chain armour or even leather with a pair of goggles made from toughened motor screen glass would be invaluable to captains of destroyers navigators, and others in exposed positions who are likely to encounter ships armed with similar guns There were only a few cases of arterial hæmorrhage and these were controlled by tourniquets

Injuries to Bones —Most of the fractures were comminuted, and the extent of the comminution appeared to be proportionate to the nearness of the explosion A leading stoker had his right shoulder so shattered that the particles of humerus clavicle, and scapula felt like sand On the other hand a leading signalman had his left humerus broken by a piece of shell which fell off when it had penetrated to the bone

Shock was present in nearly all the wounded, and I found the administration of morphia hypodermically in ½ gr doses had a very beneficial effect Most of the casualties occurred on the upper deck, and the scene that this presented can scarcely be imagined Yet there was very little noise on board from the wounded and one was impressed by the death like silence between the periods of appalling din created by the salvoes Although the ship was in harbour and only a short distance from the shore no one attempted to jump overboard, and there was no panic The morale of the men was magnificent

The fumes of the high explosive powder used seem to have a sickly stupefying effect and perhaps caused a feeling of dizziness, but this may have been due to concussion I, personally, had been breathing more deeply than normal in assisting a wounded man up a ladder from the after torpedo flat where these fumes were particularly dense, and experienced a feeling of nausea and dizziness For several days afterwards on deep breathing one seemed to exhale the same fumes Others were affected in a similar manner

Practically every compartment occupied had some casualties except the engine room and stokeholds which seem to have been protected by their coal bunkers from the non-piercing shell The after flat, although unoccupied, was also badly damaged, and also the Captain's cabin

In unprotected ships instead of having collecting stations with stretcher parties I would rely more on the wide distribution of first aid dressings, including a bottle of tincture of iodine and a brush and a thorough instruction of the ship's company in first aid

stretcher parties were useless on this occasion and instead of these a thoroughly trained man might be allotted to each gun where he would run less risk of injury than in the objectless carrying of the wounded and be actually on the spot to render assistance. If the wound so treated were slight the man might be able to continue at his duty.

It may be argued that the presence of a wounded man would deleteriously affect the remainder of the gun's crew but this is not borne out by experience. At the end of an engagement, there is more probability of some of the nursing staff surviving than if the whole number were collected in one or two stations.

In many cases the outward appearance of the wounds suggested trivial injury, and it was only afterwards, and at times under an anæsthetic, that the full extent of the damage was disclosed. All that is necessary and indeed possible at the time is the arrest of hæmorrhage, which is rare and the quick application of iodine and first aid dressings. This does not need elaborate skill.

I would also be inclined to add to each bag of dressings a bottle of morphia in solution of such strength that a syringeful contains ¼ gr. Waterproof or damp-proof bags might be made to contain the dressings. As the electric light is almost certain to fail, especially in compartments that have been hit and as these spaces may contain a number of wounded, I would suggest that electric torches be provided for first aid parties as giving a good movable light, free from the risk of fire.

Arrangements for the Treatment of Wounded in Action in the "Pegasus"

Collecting Stations.—Two collecting stations were selected (*a*) The stokers' mess deck forward on the lower deck below the sick bay; (*b*) the torpedo flat aft on the lower deck, below and forward of the ward room. These compartments were selected as being the only feasible places to which the wounded could be transported and because when completed with coal and stores the deck of these spaces was about 4 to 6 ft. below the water line.

One station was in charge of the sick berth steward, who was assisted by one cook from the galley, the foremost stretcher party and forecastle party. One station was in charge of the staff surgeon, who was assisted by one cook, and the after stretcher parties and the poop bearer party.

The two collecting stations were supplied with first aid

instruments, medical comforts (bovril, &c), feeding cups, dressings, lotions, hot and cold water, also two wide neck bottles of morphia in solution (a syringeful containing ½ gr) On "action" being sounded the cooks brought with them to their respective stations a "fanny" of hot water and two others a similar amount of cold water

All the first aid parties fell in at these collecting stations

The stores for the foremost station were kept ready in the sick berth, in portable sizes and those for the after station were kept in the dispensary, opening off the torpedo flat Additional dressings were also provided in the ward-room and in the sick berth

Each gun was supplied with a canvas bag containing one india-rubber tourniquet and six improvised calico tourniquets (with a cork sewn crosswise in them), a number of bandages, and a packet of sterilized dressings (inside being a roll of gauze and lint, surrounded by a roll of cotton wool, the whole rolled in calico bandage) a pair of scissors, and a pad of tow These bags were fastened inside the shields of the guns, and inspected frequently A similar bag of dressings was also supplied to the forebridge and to the after control, and these two positions were also supplied with a hypodermic syringe and morphia solution The yeoman of signals and the officer in charge of the after control were instructed in their use The engine-room, in addition to the bag of dressings, was supplied with jars of carron oil and some picric acid dressings These were kept in the engineer's workshop Special lights were fitted in the two collecting stations

Owing to the difficulty of passing the wounded down the ladder to the foremost collecting station (a steel support for the hand pump came directly opposite the hatch), only patients who were able to walk were sent below and those unable to walk were placed between parallel hammocks on the upper deck on the starboard side forward of the sick-bay Those brought to the after collecting station were passed down through the torpedo hatch in a horizontal position and placed between hammocks arranged similar to above

Stretchers—The stretchers provided were of plain canvas, with two bamboo poles kept stretched apart by collapsible bar at each end, standing on 4 in iron supports These were found so unsuitable that the following alterations were made by me —

(1) A perineal pad and straps for the thighs were attached (2) straps to go over the shoulder (3) strap for the legs above the ankles

From the outbreak of war three stretchers were kept in position on the upper deck one under the break of the forecastle, one amidships at B pump, and one just under the poop On the forecastle and poop hammocks were kept fitted in a manner similar to the stretchers each provided with a lowering rope at each end On the forebridge, a similar hammock was kept, fitted with a long rope which passed through a block attached to the foremast, and by this a wounded man could be lowered in an upright position to the forecastle A steadying rope was fitted to the lower end For the stokehold and engine room, a canvas seat was made for conveying the wounded from below This was improvised with two armholes A rope attached to the middle, behind and above the head and two side ropes A steadying rope was attached to the middle of the front of the seat This arrangement worked fairly well in practice

The stretcher and hammock parties consisted of seven non combatants of the ship's company distributed as follows Two on forecastle, two on poop one in charge of each of the three stretchers The stretchers had in addition two coloured men each

Transport and Treatment of Wounded

Directly after the action the s s "Banffshire," which was lying two cables ahead of us had lowered her boats, and as soon as the firing ceased, very promptly sent them to our assistance The wounded were placed in hammocks (which were lashed and stowed in the nettings on the upper deck) and sent ashore in the "Banffshire's" boats All the wounded had first-aid dressings applied and nearly all the serious cases had had a hypodermic injection of ¼ gr of morphia All were landed within an hour The landing was difficult owing to the rapidly ebbing tide, and boats being required as soon as the wounded were landed to return and stand by the ship as it looked as if it would be necessary to abandon her From the European Hospital the less serious cases were conveyed by motor-cars, rickshaws, &c, lent by the residents, to the other two outlying hospitals Stretchers were found useless on board, but the bags of dressings at each gun were of the greatest service, and the men who had been trained in first aid greatly assisted each other The landing was facilitated by the loan of stretchers from Major Skelton, R A M C, who had had a large number made in view of the expeditionary force against German East Africa which was expected from India It was impossible to examine all the

[illegible] as to the [illegible] but from general observation at the [illegible] the majority [illegible] the result of general mutilation and head injuries. One man had his head removed except a small portion of the occipital bone; another was hit in the chest by a piece of shell, which passed through his heart. On the stokers' mess deck the men were in their hammocks when a shell exploded, killing four and fatally wounding two others. This accounts for the large number of stokers killed, notwithstanding the fact that the engine room and stokehold were undamaged.

	Killed	Wounded
P. O.'s and seamen	9	40
L. R. A.'s and stokers	9	14
Marines	3	3
Daymen, &c.	4	12

The hospital accommodation on shore was excellent, and had been arranged with commendable forethought by Dr. MacDonald, P.M.O., Zanzibar.

Conveyance of Men in Hospital Ship "Gascon"

Orders were received from the Commander-in-Chief to convert s.s. "Gascon" into a hospital ship to convey those of the wounded fit to travel to Simonstown. The medical staff on board consisted of Dr. Stitt, the ship's surgeon, and an ex-R.A.M.C. stretcher bearer. I applied for another surgeon to assist on the voyage, and I eventually obtained the valuable assistance of Dr. Curment, Assistant Medical Officer of Health at Zanzibar; also two native hospital boys and a Cingalese dispenser. A number of stewards on board the "Gascon" also volunteered to attend on the wounded and act as stretcher bearers to and from the dressing station. A number of first- and second-class cabins were selected, and a "skid" built for hoisting the wounded. Out of the total wounded, thirty-two were able to be transferred, five were unfit to move, and the remainder were able to resume duty at an early date. Of the five unfit to move two subsequently died. As the depth of water at the hospital steps did not admit of lighters remaining alongside except at high water, the less serious cases were embarked on the evening of September 29, and the remainder on the following morning. The stretchers were put on the lighter decks and towed alongside the "Gascon." The stretcher was then placed on the skid and, accompanied by a man at each end, hoisted on board by a derrick. The voyage south was uneventful, and all

[illegible] improved rapidly in health. We [illegible] on October 9, but, owing to the north-easter [illegible] were unable to land the wounded until the morning of [illegible]. They were then all transferred to the R.N. Hospital.

Notes on the Cases

(1) [illegible] A compound comminuted fracture of left ankle opening into [illegible] compound fracture of leg about the lower third; (c) a com[illegible] comminuted fracture of left thigh near the great trochanter, with [illegible] lacerated wound of muscles of left buttock. His thigh was dis[illegible]culated at hip joint and a triangular radiating fracture was found in the acetabulum. He died shortly after the operation. This officer was running along the port side towards the forecastle when he was hit in the ankle and fell under No. 3 gun. Two men went to his assistance, but another shell exploded close at hand killing one and wounding the other, and apparently causing the injury to the officer's hip which proved fatal. I personally attended to his injuries on board, and also administered morphia hypodermically.

(2) Compound comminuted fracture of both legs, that of left just below knee joint, and that of right passing through knee joint. Also a lacerated wound about 1 in. in diameter penetrating the right side of chest at angle of scapula causing pneumothorax. Amputation of both thighs above the knee joints was performed, but he died shortly after the operation. He was wounded soon after the engagement began; tourniquets were applied to both legs, and a pad of wool and gauze placed in thoracic wound. He was on the port side of the upper deck just outside the ward room galley.

(3) (a) Laceration of frontal lobe of brain; (b) both eyeballs and upper part of face completely destroyed. He died at the European Hospital shortly after being brought ashore.

(4) (a) Penetrating shell wound of left parietal region; (b) lacerated penetrating wound of abdomen. He died the same day.

(5) (a) Compound fracture and laceration of frontal lobe of brain left side; (b) destruction of left orbit and part of face. He died the same day.

(6) (a) Penetrating wound of skull; (b) lacerated wounds of face; (c) compound fracture of right arm and right thigh. He died the same day.

(7) A compound fracture of the neck of right humerus. A large fragment of shell had penetrated his right axilla and tracked downwards through the lung. It had also probably penetrated the diaphragm as the patient complained of severe abdominal pain. He died the same day.

(8) (a) Deep wound of right side of neck; (b) flesh wounds of right arm and shoulder; (c) wounds of back penetrating abdominal cavity. He died from peritonitis at 3.45 a.m. on September 21.

(9) (a) Punctured wound of skull ½ in. in diameter situated 2½ in. above inner half of left eyebrow; hernia of lacerated brain tissue; (b) perforating wound through muscles of left buttock; (c) small multiple superficial wounds back of legs and left foot. Signs of compression

appeared [illegible] He [illegible] September 25, and fragments of [illegible] Pulsation of brain [illegible] the patient [illegible] and passed urine involuntarily [illegible] pupils developed and Cheyne Stokes breathing appeared He eventually died on September 27 A piece of shell weighing just over [illegible] ounce was found in his left ventricle. After his injuries this patient applied first aid dressings to himself and offered to assist the other wounded He stated that he had received a few scratches only I sent him ashore in one of the first boats and when I examined him later I found the foregoing injuries

(10) Wound passing through base of nose, left orbit and left cheek emerging below left ear causing (a) compound fracture of base of nasal bones and cribriform plate of ethmoid (b) complete destruction of left eyeball (c) motor facial paralysis left side from injury to branches of nerve (d) superficial wound left shoulder in direct line with above and probably caused by same missile Direction of missile from nose to ear suggested by splinters of wood in eyelids of damaged left eye and eversion of tissues at wound below ear a portion of parotid gland was found at outer angle of orbit At operation the left eye was excised Direct continuity between nasal, eye and parotid wound was found and all the track contained fragments of nasal orbital malar zygoma superior maxilla, and a part of the ramus of the lower jaw All pieces were carefully removed and an attempt made to cut off nasal cavity from wound of orbit and cheek by attaching mucosa of nose to edges of wound Case has progressed very favourably

(11) (a) Deep irregular shell wound back of base of neck, right side through trapezius fibres, passing forward towards right clavicle which was fractured (b) pressure on brachial plexus (c) irregular 2 in wound just below angle of right scapula and to outer side, through the fibres of latissimus dorsi The wound in neck was found to communicate with fractured clavicle (compound) at about the middle of the bone Sanguineous and purulent discharge from both wounds The tenderness of the neck and oedema of the shoulder made the fixation of the limb for the fractured clavicle difficult The previous pressure and bruising of the brachial plexus has partially passed off The two wounds have been found to communicate so that a foreign body is not likely to be retained No fracture of scapula can be detected nor do any ribs appear to have been damaged The position of the wounds would suggest that the patient was in a slightly stooping attitude with the head down and that the entrance wound was at the angle of the scapula the missile passing under the scapula and out at the wound in the neck The shock of the [illegible] would probably cause the patient to fall down, and so cause the fracture of the clavicle The result has been paralysis of the serratus magnus from injury to the nerve of Bell

(12) (a) Severe laceration and destruction of tissues from fingers to elbow of right arm, (b) laceration and bruising of the lower part of upper arm (c) small multiple splinter wound of back shoulders left [illegible] (d) deafness and purulent discharge from right ear resulting from ruptured tympanum Right arm was amputated [illegible] of humerus and several small splinters removed from his back [illegible] The amputation wound healed well and patient is now convalescent

[illegible] (b) deep [illegible] ulnaris [illegible] (c) [illegible] left [illegible] at junction [illegible] and [illegible] and amputation [illegible] performed. Secondary [illegible] has not [illegible] controlled and [illegible] has [illegible] September 30 [illegible] had [illegible] days on the sick list [illegible] time [illegible] would account for the [illegible]

(14) [illegible] back to the right of [illegible] level of [illegible] sternal head of sternomastoid [illegible] the direction [illegible] upwards, downwards, and outwards. (c) superficial [illegible] forearm from which small foreign body was removed. [illegible] palpable and audible systolic thrill extending outwards [illegible] of sternomastoid muscle would appear to be an aneurysm [illegible] the common carotid and internal jugular vein. The tumour [illegible] increased appreciably in size and the foreign body is retained. There has been no noticeable change in his condition.

(15) (a) Penetrating wound right upper arm outer aspect, entrance wound at junction of upper and middle thirds through deltoid and biceps muscles downwards and inwards, grazing the humerus, exit wound about the middle of humerus in front of vessels and nerves which were uninjured. (b) perforation of both tympani; (c) comminution of outer part of humerus at entrance wound. Wound healed well, after scraping of bone, but permanent partial loss of hearing in both ears.

(16) (a) Penetrating wound left forearm, entrance an inch below head of radius on mid flexor aspect, downwards, backwards and inwards to exit at junction of middle and lower thirds; compound comminuted fracture of ulna between the two wounds; vessels and nerves apparently uninjured. (b) superficial wound of left shoulder. (c) puncture wound of right forearm ½ in. deep on outer side of mid-flexor aspect. (d) nail of right thumb torn off. The wounds healed well, but there is partial loss of supination of left forearm.

(17) Compound comminuted fracture of left forearm shattering 3 in. of the shaft of the ulna from ½ in. below olecranon and the head and upper fifth of the shaft of radius. An attempt was made to save the arm but amputation was subsequently necessary, and was performed at lower third upper arm.

(18) (a) Wound of right parietal region 1 in. from mid line, slightly posterior to Rolandic fissure, penetrating skull with hernia of brain tissue; wound ½ in. in diameter, roughly circular; small spicules of bone were removed from the protruding brain tissue. (b) deep wound penetrating left flank 2 in. above crest of ilium and 3 in. from the spine admitting one finger; margin of kidney could be felt, but was uninjured; the flank wound caused no abdominal symptoms except a small clot of blood and mucous passed *per rectum* on the day following the injury [illegible] (c) flesh wound of left upper arm on middle posterior aspect [illegible] which small pieces of shell were removed, and multiple superficial

[illegible] the patient [illegible]
[illegible]

(1[illegible]) [illegible] below [illegible] inch w[illegible] penetrating [illegible] large piece of spirit [illegible]

(3[illegible]) [illegible] radius and ulna of right arm [illegible] upper third (b) superficial wound of [illegible] buttock (c) [illegible] wounds of back. All wounds healed well.

(31) (a) Contused wound just behind the internal malleolus of left [illegible] no tendons injured but posterior tibial artery divided vessel tied (b) penetrating wound of right thigh about the middle of posterior aspect with large piece of shell embedded in flexor muscles 4 in. higher [illegible] slightly upwards (c) small puncture wound behind vessels and upper right arm haemorrhage into tissues and bruising as far as elbow [illegible] numbness pain in hand and fingers (d) small multiple wounds and [illegible] of right leg and thigh. Case has progressed favourably.

(32) (a) Contused wound of forehead above inner half of right super[illegible] ridge (b) penetrating wound of inner lower segment of right cornea with prolapse of iris haemorrhage into anterior chamber (c) three puncture wounds back of right forearm just below bend of elbow two [illegible] extensor muscles and other internal to [illegible] (d) contusion of [illegible] finger of left and thumb of right hand) fracture of first right [illegible] bone (e) contusions of face with suspected fracture of frontal [illegible] with supra-orbital tenderness. Intra-ocular tension diminished. It was found necessary later on to excise right eye. Case has progressed favourably.

(33) (a) Lacerated penetrating wound right scapular region below [illegible] spine direction downwards and inwards no fracture or foreign body found but patient has complained of pain on deep inspiration there was no fluid in pleura or sign of lung injury (b) superficial puncture wound of front of both thighs. Later, a pint and a half of pleural fluid was aspirated from right side of chest and X-ray examination showed fracture of ninth rib and foreign body lodged at the side of body of the second lumbar vertebra. The foreign body is still retained and the patient has resumed duty.

(34) (a) Lacerated perforating wounds of left forearm causing compound fracture of both bones. Missile entered on inner side about 2 in. above the lower end of ulna, and passed transversely across the forearm emerging on the dorsum shattering the inner side of the radius and fracturing the outer segment which is held together by periosteum; the ulna was comminuted for 4 in. of its length (b) superficial wound of left side of scrotum. The case has done extremely well and patient will have the use of his hand but there is permanent loss of extension of fingers.

(35) (a) Penetrating wound of right eye at outer margin of cornea with prolapse of iris and escape of aqueous fluid, foreign body retained in back of eye (b) superficial wound about 1 in. long on outer side right thigh junction of middle and lower thirds. The wound in eye healed up after almost complete iridectomy but there was a good deal of

trauma [illegible] necessary [illegible]

(26) [illegible] inner seg [illegible] which became [illegible] small ante[illegible] were removed [illegible] but there has [illegible] been consult[illegible] penetrating wound of right [illegible] through extensor muscles [illegible] slightly upwards. End ends of [illegible] under tendon of biceps. An abscess formed [illegible] to petal ship "Gascon" and foreign [illegible] removed in hospital Simonstown [illegible] elbow joint on brachialis anticus muscle. [illegible]

(27) (a) Lacerated wound [illegible] with considerable bruising and [illegible] ring extending upwards towards [illegible] (b) small punctured wound below [illegible] from which a small piece of [illegible] hospital ship "Gascon." (c) superficial [illegible] An abscess formed over right [illegible] and was opened. A track was found leading [illegible] wound, also [illegible] in the direction of the wound [illegible] spine. This would suggest that some missile was the cause [illegible]. The want of continuity of the track was probably [illegible] of the tissues, some time having elapsed since the injury. [illegible] to England from Simonstown for duty.

(28) Penetrating abdominal wound [illegible] direction downwards and backwards. [illegible] was protruding from the wound. The patient died on the morning of September 22, from peritonitis. It was found at the post-mortem that the missile had passed through descending colon, two loops of small intestine, had torn branches of inferior mesenteric vessels, and lodged in pelvis on opposite side.

(29) Lacerated penetrating wound [illegible] left scapula, direction vertically downwards. The bottom of the track was opened and the tenth and eleventh ribs found fractured, with a piece of serge attached to the fractured ribs. The missile had entered the chest. Pleural fluid with very little blood and only a trace of pus was drained off, but the patient died on September 27. A post-mortem examination disclosed the pleura and lung uninjured, a perforation of the diaphragm with a piece of serge at the side of the opening, a rupture of the posterior part of the spleen behind the peritoneum, a track downwards behind the left kidney, and a piece of projectile lodged in the psoas muscle.

(30) (a) Penetrating wound of chest on right side in third intercostal space slightly anterior to the nipple line; this resulted in pneumothorax. Later a foreign body was removed from the same side, embedded below the latissimus dorsi muscle at the same level as entrance wound. (b) contused wound of right eye with effusion of blood into both chambers, but no external wound of eyeball; upper eyelid lacerated in outer fourth

and two [illegible] bodies [illegible] (three) [illegible] right clavicle. From all these foreign [illegible] beneath the skin. The [illegible] removed from the dangerous [illegible] before [illegible] 30. The haem[illegible] rhage in the right eye [illegible] and defective, and intra ocular tension [illegible] There is [illegible] light entering at upper segment only [illegible] graph shows [illegible] foreign bodies in right orbit outside eyeball [illegible] small foreign body about 4 in deep [illegible] close to the right of the [illegible] The [illegible] was landed from hospital ship Gascon on October 11 and subsequently invalided to England.

(31) [illegible] Contused wound [illegible] left leg, left [illegible] and left thigh; [illegible] of right eye [illegible] burning of left [illegible] destruction of left [illegible] of frontal bone [illegible] protruding. The [illegible] p[illegible] [illegible]

[illegible] The [illegible] all other [illegible] [illegible]

THE NORTH SEA ACTION OF JANUARY [illegible]

[illegible] JOHN R. MUIR, M.D. [illegible]

[illegible] are the details [illegible] and the manner [illegible] in [illegible] January 24.

General Arrangements

There [illegible] Forward Medical Distributing Station an [illegible] Distributing Station two ratings trained in first aid with a Neil Robertson stretcher in each turret and one of the [illegible] gun's crew trained in first aid at each gun.

A Neil Robertson stretcher was placed at each end of the [illegible] batteries on both sides. Each turret was supplied with a first aid bag and also a hypodermic syringe with a solution of morphia which when the syringe was filled gave a dose of ¼ gr. One of the ratings trained in first aid was taught how to give a hypodermic injection but was only allowed to administer it on the orders of the officer of the turret. The ratings trained in first aid at the [illegible] guns were also supplied with a first aid bag but no hypodermic syringes.

Forward Distributing Station

This station is situated almost immediately below "B" turret. The ship's armour at the side is 6 in. thick and there is a 3 in. casing round the station itself with an armoured door. Except for its unpleasant proximity to the [illegible] magazine it is probably the safest place in the ship. It is properly fitted up with hot and cold water light medical store room and cupboards operating table, &c.

Prior to the action the whole station had been sterilized and painted out and the corticene on the floor covered with shellac varnish. The station would be better with the addition of [illegible] but to supply this means cutting through armour.

Personnel Attached. The staff surgeon, 1 surgeon, the fleet paymaster, the chaplain, 1 sick berth steward, 2 sick berth attendants, 1 chief and 3rd writer, 1 cook and 1 officers' steward.

After Distributing Station

This is on the main deck, almost under "X" turret and is simply an open athwart ship space. It is protected by the 6 in. armour of the ship's side and is surrounded by officers' cabins.

[illegible] wounded men [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] I had already decided [illegible] lieutenant that [illegible] help him- [illegible] in the turret [illegible] tion as it [illegible] handle [illegible] working [illegible] on deck [illegible] well I refused [illegible] shell [illegible] turret had killed two [illegible] instantly and the [illegible] found their way to the dressing stations themselves.

[illegible] wounded man to appear was a petty officer who was [illegible] His wounds were none of them serious, but they [illegible] He was dressed with gauze after he had [illegible] up and painted with iodine solution. Hæmorrhage [illegible] of [illegible] importance. An A.B. was treated in the after dis- [illegible] for fracture of the ribs and injury to his left kidney [illegible] strapped up and placed in one of the officers' beds

[illegible] shell cam[illegible] [illegible] the upper [illegible]. This shell was very destructive [illegible] [illegible]pounds. It [illegible] up the trap hatch in the roof of the distrib[illegible] [illegible] which communicated with the gun control tower killed [illegible] [illegible] who was standing on the hatch, seriously wounded another [illegible] severely scorched the face of a third, all of whom were in the [illegible] control tower. In its explosion in the distributing office [illegible] killed six men and wounded five men. To the port 6 in. gun [illegible] the same shell killed a boy and injured a midshipman and [illegible] boys.

An urgent telephone message was received from the gun control tower, and an ambulance party was sent off in charge of a surgeon [illegible] what could be done. This party had considerable difficulties as the lights had all gone out, the alleyway was wrecked and the [illegible] up past the distributing office, which was the only possible [illegible] was [illegible] to bits and threatened by fire from the [illegible] [illegible], which was immediately below the distributing office. Thanks to the heroism and bravery displayed by a sick berth attendant and two boys all the cases mentioned, except one who [illegible] after the action was over, were brought down to the [illegible] distributing station.

When they arrived seven were dead or expired as they were [illegible] on the floor. The dead were laid on one side as decently and [illegible] covered with a flag, and the wounded attended [illegible] dressings were applied with the utmost despatch. By the time this was done it was 1.15 p.m., and the action had [illegible] and a quarter.

I went [illegible] the fore bridge and asked the Captain's permission to [illegible] but he informed me that that would be un[illegible] out of the danger area. So the wounded [illegible] comfortable as possible, and the dead were taken to the [illegible]. All cases were suffering exceedingly severely from [illegible] which was [illegible] by giving each of them ¼ gr. morphia [illegible] and cocoa, and applying hot bottles and [illegible]. After a little most of them became quite [illegible] went to sleep. There was a complete absence of [illegible] complaints.

[illegible] I got permission to open the sick bay, and on my [illegible] absolutely no damage to the compartment, although there was considerable damage to breakable stores from the [illegible] of the guns.

The [illegible] theatre having been cleaned and rigged, the cases

were br[illegible] one by one, thoroughly [illegible] dressed and [illegible] As we expected to [illegible] that same night [illegible] operative work was undertaken [illegible] an officer wh[illegible] given an anæsthetic and h[illegible] wounds stitched up The wounds were so numerous that [illegible] over an hour to close and dress By 7 30 p m everything [illegible]ary had been accomplished and all the patients were doing well

Cases of Interest

(1) An officer Although he was only scratched on the upper part of the face and had a chip fracture of the left ulna the shock was very severe It was probably chiefly mental but in spite of all sorts of restoratives some three hours elapsed before I was [illegible] he was out of danger

(2) An officer Both legs were severely scorched, and there was a lacerated wound of the abdomen just below the xiphi-sternum as the result of having a milled nut of the Dumaresq pointer forced into him by the concussion A rough examination made it probable that the parietal peritoneum had not been torn but the question was doubtful, and I had considerable anxiety as to whether it was fair under the conditions to submit him to the risks of an exploratory operation on board ship, or to leave him Ultimately he was left and, as it turned out, has done well

All wounds were treated either with iodine or pure carbolic, the skin surface being washed with rectified spirit before the application of the iodine It is my opinion that the pure carbolic caused dry gangrene to take place in a large proportion of a large flap wound on the inner side of a knee

The burns were treated with picric acid dressings, but became very rapidly septic

The explosion of the shells caused a black oily sooty deposit in the skin of nearly all these patients This was readily removed with turpentine but nothing else seemed to have any effect Soap and water and spirit, were useless

Three wounded had each an injection of 8 min of antistreptococcic serum This was given about 7 p m and the reaction next day was very marked, causing temperatures of 102 to 103° F with rapid, full and bounding pulses, headache and general malaise I cannot give any opinion as to its value

The Neil Robertson stretchers were of great service and it would have been almost impossible to remove the injured men without their help

SOME EXPERIENCES IN A HOSPITAL CARRIER

By [illegible]

The s.s. "Munich" [illegible] on October [illegible] with orders to proceed to Calais and convey Belgian wounded to Southampton. The staff consisted of myself, Surgeon Lloyd, Surgeon Harvey and fifty Royal Naval Auxiliary Sick Berth Reserve Ratings. We arrived off Calais about [illegible] p.m. and were met by a tug ordering us to proceed to the rescue of a ship that had been torpedoed. We at once proceeded at full-speed to Cape Grisnez and there found the Belgian refugee ship "Amiral Ganteaume" surrounded by all types of vessels. As there was no obvious need of any assistance we returned to Calais and finally secured at about 8 p.m.

The evening was spent examining the ship and devising the easiest method of stowing the wounded. From this point of view the "Munich" was extremely inconvenient: the available accommodation consisted of about 200 two- to four berth cabins and only two open spaces, the saloon, in which there was room for about thirty two stretchers, and the smoking room with room for sixteen. The final decision was that it would be necessary to man handle the majority of the stretcher cases into berths, only the very severely wounded cases being left on their stretchers. We had a stock of mattresses, and in one or two cases men were placed on these as their stretchers became uncomfortable. Generally speaking they showed no wish to be moved, and for such a short journey it appeared to me that the fewer times the bad cases were moved the better. Whilst referring to this, I may say that the cases were handled extremely carefully and gently by the auxiliary sick berth staff, very little discomfort being caused, even though in many parts of the ship patients had to be carried along narrow corridors and round right-angled corners. We unpacked all our stores, cleared out a cabin and used this throughout as a central dressing station, all gear removed having to be returned there; this was extremely necessary, as with so many different cabins articles were liable to be mislaid.

The next morning I was requested by Colonel Alexander, R.A.M.C., the Medical Officer in charge, to assist in loading the "Jan Breydel." [illegible] Royal Army Medical Corps orderlies were striving valiantly to cope with a number of wounded as they arrived. We put about 300 wounded on this ship and then

[illegible] had our own ship. We took [illegible] [illegible] cases, the majority of [illegible] had had practically no medical atten[illegible] [illegible] All cases were met on the jetty as they [illegible] injury was inquired into, and if it was [illegible] them on the stretchers a red label [illegible] By this method each batch of stretcher [illegible] the ship knew at once whether the cases could [illegible] not and as none of them spoke French the necessity of [illegible]ally accompanying each case on board and giving instruction [illegible] The ship was filled in sections with a petty officer [illegible] of each he reported at once as soon as his section was filled.

The majority of the cases arrived in private open cars with two stretchers perched up on the back at first sight it looked very [illegible] but practically it worked very well. The cases were carried on board by a working party of Belgian soldiers, and the majority [illegible] straight from the train. In a few cases dressings had been [illegible] at the station but during the actual rush these were few and far between and the majority had had their last dressing on the field. In the last trip we made, the cases came straight from the [illegible] and were in a much better condition.

During the [illegible] week in which the English ships were assisting [illegible] of sick and wounded 7 000 were taken out of Calais, [illegible] on to this all the hospitals in the town were full. We [illegible] embarking cases at about [illegible] p.m. and sailed the next day [illegible] arriving there at 8 p.m. and at once started to [illegible] Having previously been at Southampton for disem[illegible] I can testify how rapidly and efficiently this was [illegible] Trains were ready waiting in the sheds, a volunteer Red [illegible] staff provided the men with warm drinks food cigarettes, [illegible] as one train departed another one took its place. At first all this work was done by the Royal Army Medical Corps, but afterwards they were assisted by the Naval Medical Service, Staff Surgeon Nicholls being in charge.

On our next trip we brought over 431 cases, 240 being brought on board in stretchers and on the third and final trip 1?2 cases were brought over of these 104 were stretcher cases. By the time we arrived at Southampton I always noticed that the number of our stretcher cases had diminished, the twenty four hours rest and mental effect of coming over to England proving very efficacious.

The feeding arrangements were managed entirely by the Ship's

[illegible] consisting mainly of tea, coffee, bread and [illegible] beef sandwiches, beef soup, &c. The [illegible] plates, &c., were rather heavy. We spent such [illegible] Southampton that replenishing stores was very [illegible] first trip the Royal Army Medical Corps kindly [illegible] necessaries and we also obtained stores from the [illegible] French Red Cross at Calais.

[illegible] the first trip showed that with the ship rolling [illegible] the stretchers were liable to get on the move, so at Southampton I had battens fixed to the deck in the saloon and smoking room, adjusting these so that there was just enough room for the legs of the longest stretcher to go between them; any shorter ones could easily be fixed with cushions or mattresses.

Having discussed the ship arrangements, I will now give a brief description of some of the types of cases carried. Unfortunately I am unable to discuss these in any detail, as when the ship was filling up or actually *en route* the amount of work to be done only allowed one to make mental notes of some of the cases treated.

The cases brought over were surgical and all moderately severe. The wounded were very anxious to proceed to England, but a rough examination was made of what appeared to be slightly wounded cases, and I refused to take any that we considered would be fit again within twenty-one days. All medical cases and slightly wounded were sent to Cherbourg or else attended to on the local hospital ship. The wounds were almost entirely caused by shrapnel shell or bullet; there was only one bayonet wound.

Bullet Wounds.—Generally speaking, the damage caused by bullets was much less severe than the shrapnel wounds; in the majority of cases these were clean wounds of entry and exit, and the injury was comparatively slight. Bullets passing through soft tissues always caused a moderate amount of swelling of the part due to blood effusion, and the inconvenience caused was mainly muscular. In cases, however, where bullets had struck bones there was often extensive laceration. One patient informed me that he had been hit by an expanding bullet; in his case it had entered through the right cheek and struck the left side of the lower jaw, removing the greater part of the left side of the face. Inquiry showed that this was undoubtedly one of those cases in which the bullet had been fired at short range, and on meeting with an obstacle turned on its axis and travelled sideways, the final result closely simulating that of an expanding bullet.

Shrapnel shell.—In the majority of cases the damage d[illegible] this w[illegible] severe nature, the tissues being greatly lacerated. Almost without exception these wounds were septic and many of them gangrenous. Here I may remark that on going into a ward it was usually easy to tell if wounds were gangrenous or not without removing the dressings, the smell being quite characteristic, a sweetish putrid type of odour. Many of the cases showed multiple injuries, and a large number of the wounds were in the back of legs, &c., due to shrapnel bursting overhead when the men were lying down in trenches or on the ground. It was very interesting to see the extraordinary, and, from the patient's point of view, lucky route taken by some of the pieces of shell. Two cases may instance this: a Belgian cyclist was struck by a piece of shrapnel in the back of the neck about the level of the sixth cervical vertebra; in some inexplicable manner this travelled upwards and forwards without causing any marked injury to the tissues, and we removed it finally from the subcutaneous tissue in front of the left malar bone. It was a perfectly circular piece of metal about the size of a large marble. A sous officer was struck on the outer side of the left arm about the level of the deltoid insertion; on his ticket it was stated that the left humerus was fractured, but I could find no signs of this. From this position the fragment of shell travelled subcutaneously across the front of the chest, and we removed it from in front of the right pectoral. How it had avoided entering the chest I cannot imagine.

Two cases died on board, one from general peritonitis following a bullet wound of the abdomen, and one was a case of *emphysematous gangrene*. This case was under the care of Surgeon M. L. Lloyd, and I am indebted to him for a description of the symptoms: the patient had been wounded in the lower third of the left thigh by shell splinters, the joint being opened; the muscles of the leg were badly lacerated and the wound offensively septic. The thigh above the wound was discoloured and much enlarged, giving a crackling feeling to the touch. Just before death the lower part of the abdominal wall on the same side was becoming emphysematous. In the upper part of the thigh there were a number of bullæ on the skin filled with a brownish red fluid; the patient showed considerable jaundice and was tender over the liver. He died quite suddenly on the same day we took him on board. On all our trips we carried a Belgian priest, and the work he did was most excellent; he was trained in first aid, and was extremely useful in comforting some of the Flemish cases and explaining the necessity for dressings and small surgical procedures.

[illegible] At least twenty [illegible] cases must have [illegible] in practically all of them it was purely [illegible] part of the body wounded seemed to [illegible] I think the majority of such cases were [illegible] back. The worst case was a man wounded in the right shoulder. I passed a soft catheter and drew off two and a half [illegible] of urine on [illegible], one of these afterwards the total amount drawn off was 18 [illegible]

Traumatic Neurasthenia.—We had two cases of this, the origin in each case being the same—the men had been blown up by "Jack Johnsons" without actually being struck by any splinters. Their nervous condition was most pitiable, and they shrieked with pain on being touched. One case kept his limbs in such extraordinary positions that at first I thought he had fractured both femurs, but examination showed no signs of any injury. There were no signs whatever of any bruising, and it had had ample time to show itself under the skin. They were both insistent in their demands for "une pique de morphine," having obviously had this at the field hospital; in each case a syringeful of *aqua pura* sent them to sleep within about fifteen minutes.

Paraplegia.—We had one case. It followed the explosion of a shell in the vicinity of the man, who was blown backwards into a trench, and found immediately afterwards that he was unable to move his legs. There was paralysis of both legs, muscles being rather flaccid; reflexes were obtained but were greatly diminished. Sensation was difficult to obtain accurately, the patient being Flemish and not understanding French, but as far as could be made out cutaneous sensation was almost abolished; deep pressure was painful. No girdle hyperæsthesia could be demonstrated; there was no trouble at all with the sphincters. This case could not be followed up, but was probably one of that transient type of which so many have been described since the commencement of the war.

Secondary Hæmorrhage.—The one case we had demonstrated the difficulty of nursing wounded in a large number of separate cabins. Luckily there was another patient in the cabin who, seeing that something was wrong, shouted for the attendant. The latter found the patient was bleeding profusely from a wound in the thigh, and at once applied pressure to the common femoral. I saw the man almost immediately after this and put on a tourniquet; there was a pool of blood in the bed nearly 1 in. deep; the patient was pulseless and had marked Cheyne-Stokes breathing.

No [illegible] appr[illegible] [illegible] by [illegible] the patient [illegible] rapidly [illegible]. As we [illegible] at [illegible] sent the [illegible] to [illegible] such [illegible] [illegible] officer [illegible] the [illegible].

[illegible] Chest and [illegible].—One could [illegible] from [illegible] by the few symptoms the majority [illegible] showed. In [illegible] the bullet entered through the [illegible] and came out just above the pubes; there was a small [illegible] from which urine was trickling, but beyond this the [illegible] to have no symptoms whatsoever. Cases with bullets through the chest were [illegible] spitting up a little white frothy phlegm and did not appear to have dyspnœa.

Multiple [illegible].—I will [illegible] the one case as ill[illegible] extraordinary severity of some of the wounds. This [illegible] a Belgian priest who was struck by a shell when he was [illegible] wounded from the trenches. He had compound fractures of left thigh and right shoulder [illegible] wound of the [illegible] many smaller wounds about the head and neck. His leg [illegible] splinted with [illegible] this away and put on a long Liston. As he was getting paler with feeble pulse we [illegible] to see if he was bleeding from the back of the thigh and [illegible] discovered that he was [illegible] his blanket [illegible] to the ankles. He was too [illegible] for an [illegible] bath, so he was lifted on the blanket and [illegible] beneath cut a hole in it so that the patient could [illegible]. After this we gave him egg, milk and brandy every two hours and water every hour, and he showed marked improvement [illegible] probably no actual bleeding, but he was suffering from [illegible].

Treatment in General.—This was continued almost [illegible] first and all the patients we possibly could were [illegible] and ticketed to show the time and date this was [illegible]. Morphia [illegible] not spared at all in cases where there was [illegible] pain [illegible] majority of the cases had had it at the field hospital [illegible] anxious to have more. In some cases we found injections of water were equally efficient when the necessity for morphia did not seem so obvious. All morphia cases were ticketed with the date, time of administration and the amount given. In one or two cases pieces of shrapnel were removed where they were necessitating pain or inconvenience. The majority of the fractures were put up again; a large number of them had been put up merely with strips of lead foil moulded round the limb. In one or two cases it was extremely difficult to remove the dressings owing to a tight bandage which

had been put on the limb [illegible] of the bandage [illegible] completely [illegible] greatly assisted in the dressings by [illegible] November 12 we paid off the Belg[illegible] line and the number of wounded availabl[illegible] tion of the various ships of our class.

I think I can safely say we all regretted [illegible] the work was extremely interesting, and the w[illegible] for anything one could do for them. As pat[illegible] nificent, bearing what must have been [illegible] the most plucky manner.

[illegible] RESEARCH [illegible] UNDULANT OR MEDITERRANEAN FEVER[1]

[illegible]

[illegible] of the Royal Society [illegible] of this disease it seems [illegible] that [illegible] the work that has been [illegible] many [illegible] parts of the world since [illegible] out the findings of the [illegible]

[illegible] variety of names, giving [illegible] views. The terminology [illegible] graphical basis those [illegible] that are chiefly personal [illegible] the first in that the [illegible] of the endemicity [illegible] want of knowledge. How [illegible] medicine [illegible] received a local name [illegible] it was met with first, and later has been [illegible] prevalent.[2] [illegible] unfair to the [illegible] in the case of Malta [illegible] South Africa. Geographical [illegible] investigation proceeds [illegible] to be dropped.

[illegible] lately been brought forward is [illegible] or no septicæmic [illegible] apply to more than one [illegible] *Melit*[illegible] of LANE, or [illegible] by BRAUNHOFF [illegible] fever has been [illegible] this name would [illegible] together all fevers [illegible] produced secondarily by them—increasing [illegible] the [illegible] of the disease, more [illegible]

[illegible] Congress of Medicine [illegible] in London [illegible] question was discussed, and it was [illegible] *Undulant fever* was the most satisfactory [illegible] by HUGHES in 1897, it does not limit [illegible] attention to one of the

[illegible]

Distribution [illegible]

most frequent clinical signs, it is euphonious, and is easily applicable to any language. This term will therefore be employed by the writer.

One may say, now, that the geographical distribution of undulant fever is world-wide; undoubtedly one of the most important endemic centres was the island of Malta; we found there the sources of supply in abundance, the presence of a continual stream of non-immunes was provided by the naval and military forces, and the hospitals were hotbeds of the disease. No wonder, therefore, that as a nation we were interested in the discovery of the cause and methods for preventing a fever which annually caused such a high rate of invaliding off the station, and so many days sickness to the fighting force.

We now know that the fever is widely spread all round the Mediterranean littoral—in Spain, France, Italy, Greece, the Levant, Egypt, Tripoli, Tunis, Algeria—and is present in most of the islands of Sicily, Cyprus, Candia, Sardinia, Corsica, &c. It is not the case that casual inhabitants are affected in these places, as believed by SHAW, but the disease is endemically present in most of them. During the past few years the extension of the disease into districts far from the sea has been shown to exist. In Spain by DE CORTES, DURÁN, RAMOS Y CAJAL and SUAREZ. In France by CANTALOUBE and WURTZ. In Italy by SANGIORGI and GOSINI. In Portugal by BETTENCOURT. This extension inland is a most important epidemiological factor, and is in agreement with the findings of the Commission and the view long held by ZAMMIT that inland villages may be as heavily infected as those near the sea.

If we leave the Mediterranean area and go east, the next recorded endemic centre is in Northern India, in the Punjab, as originally demonstrated by LAMB; going further east there is no doubt that cases occur in China which are probably of endemic origin, but very little real scientific work has been carried out there, at least that I know of, to prove the means of infection, for milk as an article of diet is but little used except at Hong Kong and Shanghai, where the dairies are well supervised. Most of the cases have been reported from the Yangtze region. In the Philippines many cases have been recognized by CRAIG and others, the disease being conveyed by the sick soldiers to the United States of America.

In Africa, besides being found in the northern states, cases have been reported from the Sudan, Blue Nile, Lake Chad, and

Uganda, and it is a well-known fact that during and after, the Boer War the disease became very prevalent in South Africa the Transvaal and Orange Free State, that is when the cattle were few and more goats milk was used German South-west Africa is now included in this large endemic region In America there appears to be a true endemic centre in Texas of considerable antiquity (MOHLER) extending into New Mexico There is probably also a small centre of infection in Peru (VILEZ)

Wherever the disease is endemically found, goats in herds are practically always present and though the Maltese goat which has been widely exported on account of its great milking value, is the most frequent offender yet other goats are equally susceptible of the infection and able to distribute the disease in Italy South Africa and America

It may be of interest to say a few words about the so called Maltese goat *Capra hircus* is the stock from which the domestic Theban or Egyptian goat has been derived these from change of environment have undergone considerable modifications and are locally known under other names—as, for instance our Maltese goat The head is small, the ears are about two thirds the length of the head and rather narrow, but never so pendulous as in the Theban goat Horns are often absent When present they are small and crumpled The tail is very short and erect The udder is very large, sometimes reaching to and touching the ground so that animals walk with difficulty The hair is long and brown; it may be pure white cream brownish or black The best points are a hornless head a large udder and reddish black coat A good goat should yield from 3½ to 5 litres of milk Evans has suggested that undulant fever is primarily a disease of the goat which had its origin in the Persian hills and has been carried by those all over the world more particularly into tropical and sub tropical climates In temperate regions the goat is but little used for milking purposes therefore selective inter breeding is neglected and the udders become less developed This explains the occurrence of the infection in Southern Europe Asia Minor India and Eastern Asia but not that of South Africa and tropical America where the variety of goat is different from that of Persia and Malta

So much is said of the infection through drinking goats milk that we are apt to forget that other ruminants may carry the disease, and that the products of milk are often infective We have long known that the *Micrococcus melitensis* is a very

dangerous organism to work with and that many inoculations in laboratories have taken place causing attacks of the fever, we also know that the organism has very considerable vitality outside the body. The view that an infected milk supply is the chief source of the disease is upheld by recent statistics, the diagram shows the incidence of the disease in the Services after the use of infected milk had been stopped; the sick list on board the ships of our fleet is small and our hospitals are practically empty of what was our greatest enemy in the Mediterranean. This is so in the Services, but the view that other methods of infection are frequent is steadily gaining ground, and these may be summed up in the words of SERGENT that in urban areas the infection is generally through ingestion of infected milk but in rural districts the disease is commonly spread by direct infection or inoculation of infected soil or milk. LÉGER describes how prevalent the disease is in Corsica, how it is widely disseminated by a few infected goats to others when they pasture in the hills; how these goats may infect the dogs and goatmen with them, how when the goats are brought down to the towns at certain seasons they are milked mostly by women, how these women become infected through the hands by the organisms in the milk and how the greater part of the milk is converted into cheese which is eaten fresh and in which the micro-organism will retain its vitality for fourteen days.

Another epidemic near Rome is described by DELLA VIDA which shows how one infected goat gradually spread the disease in the local herds, how after a year (when abortions in this herd were noted to be frequent, the only sign of infection) cases occurred among those people associated with the most infected herd, and spread quickly amongst them when once started. These people who lived under bad hygienic conditions, did not consume the milk but acquired the disease by inoculations or direct contact with the sick.

A further point which was originally demonstrated by SHAW and has lately been brought forward by MISSIROLI and SANGIORGI is the danger caused by ambulant human cases: these may be passing out the micro-organism in the urine infecting the soil and outhouses, and conveying the disease to those employed in these places.

As in typhoid one must look to the three F's—food, fingers and flies—as possible carriers of the organism. Children at the breast are rarely infected directly. TOMASELLI believes that they

possess a certain amount of immunity, but infants do sometimes show signs and give positive serum reactions as shewn by LONGO at Catania, and LUNA of Palermo, in fact, the latter thinks that cases are more common than can be inferred from the number reported because many are not recognized As the *M melitensis* has been shewn by EYRE to be present in the milk of infected mothers this is probable

At Kleber in Algeria, SÉJOURNANT describes a small but interesting, human epidemic In one family four out of five were attacked these possessed no goats, and drank only boiled milk from an uninfected source All the members, including the goatherd, of the family which had lived in the house previously had suffered from the fever In this instance the infection was believed to be a purely local one, due to the contamination of the house and sheds before the owners took possession

In descriptions of the infecting micro-organism there is again much discrepancy HISS and ZINSSER go so far as to call it the *Bacillus melitensis* others call it a cocco-bacillus some say it is motile and describe flagella as being present From a very large number of examinations I believe the organism to be a true coccus, often under cultural conditions seen as diplococci due to the division of the coccus In old cultures bacillary forms are common, these are involution forms and favoured by different media Where growth is vigorous, long chains tend to be present made up of diplococci this streptococcic character is like that which occurs in the culture of the pneumococcus and is morphologically interesting (BASSETT SMITH) The *M melitensis* according to FLORENTINI is able to produce a toxin which acts as a hæmolysin

Pathogenicity—EYRE and others have shown that besides monkeys and goats, horses, dogs, rabbits guinea-pigs rats and mice can be experimentally infected Rabbits, after subcutaneous inoculations with living cultures of the *M melitensis* will give a serum having a high agglutinating power but a true septicæmia does not appear to be produced as the organism cannot be recovered from the circulating blood these animals were found by EYRE to die in about six months Two animals I have used for this purpose reacted up to 1 in 2,000 but have gradually lost these agglutinating reactions and have made complete recoveries Guinea-pigs are not generally affected, unless the pathogenic power of the organism is raised and the injections given intracerebrally In rats and mice antibodies are formed in small amounts or not at all

The infection may be naturally acquired by man, goats, cows, sheep, horses, mules, and dogs.

In 1912 NÈGRE and RAYNAUD while testing various strains of the micrococcus in their laboratory at Algiers, found one that though it gave the morphological and cultural characters of the type, yet was able to agglutinate only with very low dilutions of serum rich in antibodies for the type. On working this out it was found that animals injected with this strain produce a serum rich in antibodies for itself but which only agglutinated other strains in low dilutions. It is also possible to remove the antibodies for one without affecting the other as shown by absorption tests. This variety, which had been suspected by ZAMMIT, is therefore distinct from the type in its serum reactions and is described by NÈGRE and RAYNAUD as *M. paramelitensis*. The strain had previously been known as *M. melitensis* Br. It is a curious fact that this strain had been originally isolated by BRUCE and had been kept without its peculiar characters being recognized in the laboratories of Algiers and Tunis, from which places sub-cultures had been widely distributed to other laboratories in Europe—thus probably causing many of the errors in diagnosis which have been so frequently reported.

In 1918 I was able to report a very prolonged case of fever in a lady, contracted at Hyères, in which, though the symptoms were those of undulant fever, no positive reactions could be obtained. The serum was tested in many laboratories and by different experts; when the blood was tested with the paramelitensis strain it reacted up to 1 in 400. Human infections therefore exist as well as animal.

In the routine examination of goats in Algeria, SERGOUKNANI reports that out of 490 tested, in only 20 were positive lacto-reactions obtained: 11 of these were with the *M. melitensis*, 9 with *M. paramelitensis*, and 2 with both; and he found that most of the infected goats had been received from Spain. The frequency of the infection of goats by the paramelitensis strain is of great importance.

If we now turn to the methods of diagnosis, those for animals and humans must be separately considered. From the work done by the Commission, it was recognized that in the diseased animals there was a general infection of the blood, spleen, liver, kidneys, as well as in the lymphatic system especially affecting the deep glands. The specific micro-organism passed out of the body in the urine, fæces, and milk. From the urine and milk more or less pure

cultures could be frequently obtained, thus giving definite evidence of the disease. The lacto reaction as introduced by ZAMMIT and HORROCKS came to be the most readily and generally used method for detecting the infected goats, and this could always be controlled by serum reactions or other more certain methods. A table of the percentage of infected goats in the different localities made out in 1912, is thus given —

Malta, ZAMMIT	50 per cent
Algeria SERGENT	3 4 ,,
Tunis NICOLLE	30
Marseilles, CONOR and HUON	34
St Marital, Gerd, AUBERT and CANTALOUBE	29

Recent work tends to show that in many of the infected goats there is a localization of the organism producing a mastitis without general septicæmia.

Some experiments carried out by VALLUT and REMBRAND were made on various laboratory animals with reference to the agglutination reaction. They found that with healthy guinea-pigs reactions were not obtained to higher dilutions than 1 in 20, in rabbits it rose to 1 in 50, and in twenty one healthy dogs eighteen reacted in dilutions varying from 1 in 20 to 1 in 400. Heating the serum always prevented these reactions. MARTEL TANON and CRUFFEN state that heating the serum does not always prevent chances of error and that it is indispensable to carry the serum agglutination test for goats up to 1 in 100. Also that reactions with milk are too variable to be used for diagnosis.

I have tested the serum of rabbits and guinea-pigs with the following results —

Rabbits	1	2	3
Unheated serum	+ 1 in 20	—	—
Heated serum	—	—	—

Guinea-pigs	1	2	3	4	5	6	7	8	9	10
Unheated serum	—	—	—	—	+ 1 in 30	—	+ 1 in 30	—		
Heated serum	—	—	—	—		—	—	—	—	

All the reactions were cut out by heating the serum.

These anomalous reactions have frequently been described when examining goats milk and though the lacto reaction is generally carried out as a means of diagnosis it is not always reliable and is rarely alone depended upon for prophylactic purposes, it is however of very great assistance to the sanitary officer. Cows in the endemic area, by means of lacto-reactions have frequently been noted to be infected, and in London KENNEDY obtained positive reactions in three out of twenty two cows.

TABLE I.—MILK DIRECT FROM INDIVIDUAL COWS

Dilution 1 in 2

No.	Unheated: Microscope ½ hour	Unheated: Microscope 1 hour	Unheated: Sed.	Heated: Microscope ½ hour	Heated: Microscope 1 hour	Heated: Sed.
1	–	+	+		+	+
2	–	+	+			+
3	–	–	+	–		–
4-16	–	–	–	–	–	–
17	+	+	+	+	+	+
18	+	+	+	+	+	+
19	+	+	–	–	–	–
20-26	–	–	–	–		–
27	–	–	+		+	+
28-31		–	–			
32-37	–	–	–	–		–
	3	6	6	2	4	5

Dilution 1 in 20

No.	Unheated: Microscope ½ hour	Unheated: Microscope 1 hour	Unheated: Sed.	Heated: Microscope ½ hour	Heated: Microscope 1 hour	Heated: Sed.
17-37			–	–		
	0	0	0	0	0	0

It is of the utmost importance to recognize that the reaction is a specific one and that by its means an enormous amount of public health work for the prevention of the spread of undulant fever is possible. It is therefore very important to find out the causes of error which may lead to very misleading results. I have in the laboratory at Greenwich examined a series of milk samples obtained locally, some direct from individual cows and some mixed samples of milk from different dairies. Five different strains of this *M. melitensis* were used, the emulsion being made from cultures not more than forty-eight hours old and the results were read both microscopically and by the sedimentation method. Controls without serum, with normal serum, and with serum from an unimmunized animal were used. It was found that boiling the milk cut out all the reactions and heating for half an hour at 60° C. cut out some

but not all A total of 69 samples were tested 37 were direct from individual cows and 32 were samples of mixed milks from different dairies With a 1 in 2 dilution there were six positive reactions out of 16 with a 1 in 20 dilution there were no positive reactions in 21 milks examined direct from the cow

TABLE II —Mixed Milk from Different Dairies

No	1 in 2			1 in 20		
	Microscope		Sed	Microscope		Sed
	½ hour	1 hour		½ hour	1 hour	
1	−	+	+	−		
2	+	+	+	−		+
3	+	+	−			
4	−					+
5			+			+
6	+	+	+	−		+
7		+				+
8		+				
9						
10			−			
11						
12		−				
13						
14 22						
23	−	−	−			
24	−	−	−			
25 31		−				
	[illegible]	13	12	1	1	11

With thirty-two mixed milks there were 12 positive reactions with a 1 in 2 dilution, and eleven with a 1 in 20 the highest agglutination obtained was 1 in 100

When the milk is kept the reaction may quickly change as shown in Table III A sample of milk direct from the cow gave a complete negative reaction to all the tests when examined at once, but in thirty-eight hours it had turned to positive in a dilution of 1 in 20

Five samples from individual cows which had given positive reactions in low dilutions were plated out for the isolation of the

M melitensis, but without success No serum could be obtained from these animals, but they were stated to be in good health

By using a forty-eight hour culture for the emulsion and a dilution of 1 in 20 no positive reactions were obtained from the milk of twenty one cows examined quite fresh, but after keeping and in using mixed samples a high proportion reacted positively in that dilution It is very necessary to centrifuge the milk very thoroughly or use whey and to heat it for half an hour at 60° C There is no doubt that cows milk in some cases has a tendency to agglutinate the *M melitensis* but if care is taken most of these non specific reactions may be avoided The absence of any endemic undulant fever in London is strong evidence against there being any true infection of the cows

TABLE III —Milk direct from Cow No 4

1st Day

Dilution	Unheated ½ hour	Unheated 1 hour	Unheated Sed	Heated ½ hour	Heated 1 hour	Heated Sed
1 in 2		−		−	−	
1 in 20			−	−	−	−
2nd Day						
1 in 2		+	+			
1 in 20		+	+		−	+

Showing change for time

In man the diagnosis is made with most certainty by cultivating the organism from the blood, this is generally successful in early cases with well marked fever, when an advanced cachectic condition is present this procedure will often fail From 1 to 5 c c should be drawn off and distributed into two flasks of nutrient broth from which sub-cultures into agar can usually be obtained about the third day The agglutination reaction with the serum is the most common diagnostic method either observed microscopically or by means of sedimentation tubes Using unheated serum, Carrieri and Angrada found that with certain strains of *M melitensis* non specific reactions may occur in dilutions from 1 in 10 to 1 in 200 but with specific sera these variations with different strains were very slight they therefore recommend that for diagnosis a serum should be tested with many strains before a conclusive opinion can be

formed. This is not my view [illegible] emulsion of known agglutinable power and using all precautions errors will be very few. I therefore use a forty-eight hour agar growth. From this a strong emulsion is made. Allow any auto-clumps to settle, and pipette off the clearer part for use. Have two tubes of serum, one heated to 57° C. for half an hour and one unheated; test each in dilutions of 1 in 10, 1 in 100, 1 in 400 microscopically and by the sedimentation method. I place the latter tubes in the hot incubator for two hours and then read off; they are next set aside in the cold for twelve hours and a final reading taken. For controls a known specific serum and a normal blood should always be used.

Out of sixty-five control sera used by myself and tested with five strains of *M. melitensis* in only one was there a positive reaction. In a series of 150 sera from patients in Haslar Hospital in 1907 suffering from all kinds of diseases, four gave positive reaction. In these four a careful history shewed that they had been under treatment at Malta Hospital or had previously suffered from the fever.

RINCHESE states that WIDAL in his laboratory caused an emulsion killed with formalin (2 drops to 15 c.c.) to be used. This was safer and acted quite satisfactorily, keeping well for over a year. Thirty sera of cases suffering from febrile conditions other than undulant fever were tested with this emulsion and all gave negative reactions.

Agglutination reactions for undulant fever have not infrequently been found to give uncertain results. These errors are largely due to the use of unsatisfactory cultures, or serum which has undergone changes, the presence of non-specific agglutinins or to errors of technique. NICOLLE showed that a possible source of error exists in the removal of the agglutinin from sera by long contact with the clot. He therefore recommends that the serum should be pipetted off and stored for use if not required to be tested at once. That this is not always the case I showed by testing a blood which had been collected four years previously and which still reacted well in dilutions up to 1 in 200. It is, however, very advisable to use the clear serum if possible.

When carrying out the reaction the following points should be remembered:—

(1) The culture to be used should be proved to be active with known specific sera and should not agglutinate with other sera. The use of a paramelitensis strain would fail to agglutinate in high dilutions with a true undulant fever serum and give rise to a negative error.

(2) As recommended by NEGRE and RAYNAUD, the heated and unheated serum should be tested the former cutting out the non specific agglutinins and preventing a positive error in non undulant cases

(3) The test should always be carried to high dilutions up to 1 in 400 to avoid paradoxical reactions

A second sero diagnostic method which can be used is that of complement fixation This has been employed extensively by MISSIROLI and others and I have found it to give good reactions it acts as a very efficient control to the agglutination test, but the value of different strains of *M melitensis* as an antigen often shows great variations Cases may sometimes fix the complement well and give unsatisfactory agglutinations

VIGANO has lately brought forward a precipitin test as a diagnostic procedure but this is unlikely to act when the disease cannot be recognized by agglutination methods

In order of their relative value for diagnosis we have then (1) Sero culture (2) agglutination (3) complement fixation, (4) precipitin test (5) culture of the organism from the urine

The difficulties of making a clinical diagnosis are constantly being brought forward owing to the irregular character of the symptoms, the long duration of the disease, and the presence of certain abortive forms This is noted particularly in country districts of Spain Italy and Africa, where the disease is but little known amongst the local practitioners Cases are frequently diagnosed as typhoid, paratyphoid septic, and gastro-intestinal infections, among young children these errors in diagnosis are most common TROTTA and others have shown that the micrococcus may occasionally act as a pyogenic organism causing suppurative arthritis and local abscesses As in typhoid infections node like swellings on the sternum and ribs have long been known to occur in undulant fever due to a tissue necrosis caused by the micrococcus Chronic cases are easily mistaken for early conditions of infective arthritis deformans In Texas and New Mexico the disease has been known as mountain or slow fever for at least twenty five years and is always found among people employed in goat rearing, the cases being most common after the kidding season during April May and June In German West Africa SUMMA states that the disease is now fairly common, but the cases are frequently diagnosed as malaria

In treating cases it is most important to remember that we have a very long and tedious disease to deal with as this is not

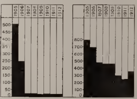
associated with ulceration of the bowel, it is therefore necessary to conserve the patient's strength as far as possible, and to give as much food as he can assimilate being guided mostly by the condition of the tongue and the height of the fever. As cardiac irritability is a common condition, antipyretic drugs for reducing the fever are generally harmful, and hydrotherapy is to be preferred. Insomnia is such a trying and common characteristic that it requires treatment; the patient should never be allowed to pass sleepless nights. Trional or other hypnotics should be given, or if pain is severe morphia may be used. Stimulants are not generally required in the early stages, but when cachexia is pronounced they often do great good. I have found preparations of yeast useful both to increase the number of the polynuclear white cells and hence assist in destroying the infecting micro-organism, and also to reduce the tendency to the development of the neuritis which is so common in the later stages of the disease.

Scordo, experimentally, has obtained very good results by treating artificially infected goats with intravenous injections of perchloride of mercury, which gave rise to an increase in the corpuscular elements in the blood, raising the numbers of the red cells and the hæmoglobin, also producing a polynuclear leucocytosis and sterilizing the blood, thus cutting short the fever. If this can be accomplished in man the method will be of great value. Marshall has also obtained some good results in animals with "606," but these require confirmation, as rabbits may recover spontaneously if the infection is not very severe. Somma and others in German South-west Africa have used intravenous injections of protargol as a germicide with success, but it is not free from danger, occasionally causing toxic nephritic symptoms and suppression of urine. Trambusti and Donzello by inoculating goats with a nucleo-proteid derived from the *M. melitensis*, have prepared a serum which is stated to have given satisfactory results when used early. Nègre and Sergent have also prepared and used a polyvalent serum with good results. Vaccines may be used with good results particularly in sub-acute cases both for melitensis and paramelitensis infections. The annexed charts show examples of the rapid disappearance of the fever under vaccine therapy. The general improvement, as shown by an increased feeling of comfort and a steady gain in weight, is often very marked in these cases, and the opsonic index is seen to rise at the same time. This method therefore holds out considerable hope in protracted cases. It is possible that a polyvalent vaccine made from many strains of

[illegible] cus might give better results The use of sensitized [illegible] requires trial

For prophylaxis it is now generally recognized in endemic areas that the disease should be made notifiable that local disinfectant methods should be carried out, that the importation of infected goats must be stopped, and that regular examinations of animals by competent persons must be periodically made In France, Italy and Northern Africa legislative action is strongly urged This has been taken in France and Algeria with good results

Undulant fever



In c[illegible] the Naval and Military [illegible] be properly [illegible] endemic [illegible] hunted [illegible] reg[illegible] inoculation [illegible] and [illegible] undulant [illegible] other ca[illegible] of the disease [illegible] disinfection of excreta and contaminated [illegible]

Historical.

JAMES LIND
PIONEER OF NAVAL HYGIENE

By H. D. ROLLESTON, M.D., F.R.C.P.
Consultant Physician to the Royal Navy, Royal Naval Hospital, [illegible]; Senior Physician, St. George's Hospital.

[illegible]

The abolition of [illegible] in the Navy [illegible] 1796 was a [illegible] preventive medicine [illegible] control of [illegible] so complete [illegible] is now little [illegible]

He was born in Scotland in 17[illegible] does not appear to [illegible] related to a[illegible] 1736–1812, M.D. [illegible] F.R.S. [illegible] in the "Dictionary of National Biography" [illegible] when quoting his [illegible] desc[illegible] him as his [illegible] author [illegible] qualification. He began his medical career on December 22, 1731 [illegible] registered apprentice to

George Langlands, Fellow of the Royal College of Surgeons of Edinburgh. From 1739 to 1748 he was a Surgeon in the Royal Navy, and in this capacity visited Minorca, the coast of Guinea, the West Indies and the Mediterranean. Almost his longest cruise was one of ten weeks in H.M.S. "Salisbury" under Commodore the Hon. G. Edgcumbe during which eighty out of 350 sailors were laid low by scurvy. This experience and the publication of the Rev. R. Walter's description of Anson's voyage round the world with its record of fatal scurvy in 75 per cent. of the crew, stimulated him later to write what was first intended to be a short paper for the memoirs of a Naval Medical Society, but grew into a book of more than 400 pages. In 1748 he returned to Edinburgh, where he took his M.D. degree, and on May 1, 1750, was elected a Fellow of the Royal College of Physicians. Of this body he became treasurer in 1757, only to resign the post on being appointed on June 1, 1758 to succeed Dr. G. Cuthbert as Physician to the Royal Naval Hospital at Haslar, four years after it was opened. During this ten years' residence in Edinburgh he brought out his great works on scurvy and on naval hygiene which so fully justified his appointment to Haslar. The classical "Treatise on the Scurvy," dedicated to Lord Anson, appeared in 1754, went into a second edition in 1757 and a third in 1772 and was translated into French by Mere of Montpelier. In 1757 he brought out "An Essay on the most Effectual Means of Preserving the Health of Seamen in the Royal Navy," dedicated to his former Commander, Lord Edgcumbe, which also reached a third edition, the second (1762) and third (1771) being published "by Authority of the Lords Commissioners for executing the office of Lord High Admiral of Great Britain, Ireland, &c." It was translated into French, German and Dutch.

At this time the posts of medical officers to the Royal Naval Hospitals were on a different footing from those of the Navy, and were not necessarily filled from those who had served in the fleets,[1] and the status of physicians was far superior to that of surgeons, who had but recently (1745) withdrawn from the ancient Company of Barber Surgeons in order to form a separate company. When first opened, in 1754, Haslar was only a third of its present size, but later, when the two side wings were in full working order (1762), the complement of patients was very large; in 1779 it was 1,900, thus providing an ample field for observation which Lind utilized to the full.

Lind's resignation of the post of Physician to Haslar, on account of the infirmities of age, was sent in on June 18, 1783, and was accepted on June 30, a minute being entered in the records to the effect that his salary ceased at midsummer.[2] The article in the "Dictionary of National Biography," on which I have freely drawn, states that he remained Physician to Haslar until his death. This mistake is not altogether surprising, as the same post was held successively by a father and son with the same initial. After the unequalled period of twenty-five years (1758 to 1783) as professional head of the hospital, James Lind was

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[1] In 1805 an Order in Council decreed that these appointments should be held only by those who had served in the public service afloat.

[2] For the extracts from the Hospital Records I am indebted to Surgeon-General J. J. Dennis, M.D., of the Royal Naval Hospital, Haslar.

[illegible]

grounds [illegible] Haslar Hospital [illegible] 1783 Sir George [illegible] printed [illegible] forms the frontispiece [illegible] sixth edition of [illegible] Incidental to Europeans in Hot Climates [illegible] much indebted to Dr. W. Hooper, [illegible] Haslar Hospital.

[illegible] by his election as an honorary [illegible] Copenhagen, who was apart from [illegible] have shared the fate of a prophet [illegible] famous in connection with [illegible] as I shall attempt to show [illegible] and hygiene.

[illegible] curiously enough, scurvy's history [illegible] valuable chronological [illegible] the publications on this disease [illegible] one of the subject the points [illegible] valuable lives in our fleets [illegible] Spanish arms, and that the [illegible] not a remedy of preventing [illegible] occasion (probably in [illegible] on the fleet coming [illegible] them they were lodged in [illegible] prophylactic against [illegible] oranges and lemons [illegible] and lemon juice [illegible] mentions on the [illegible] employed oranges [illegible] further in 1593 [illegible] sea scurvy, and in [illegible] had equal [illegible] juice which was [illegible] 1617 [illegible] pointed out by [illegible] is even [illegible] of Innsbruck (Celebrium) [illegible] Asia Minor in the fourth century [illegible] was brought to [illegible] by Baron [illegible] active agent in the famous secret [illegible] de Husson, for gout [illegible] orange and lemon juice so that [illegible] In this process the pure [illegible] the convenience of a stick in cup [illegible] earthenware vessels gave rise [illegible] the taxis on the leaden glass.

[illegible] 1888 [illegible] 87.

[illegible] Times, 1827, vol. [illegible] 1827, vol. i. p. 677.

[illegible] 165.

[illegible] Mr. [illegible] Surgeon to the Sygnedom [illegible] upon the East Indies with an ample [illegible] the first time that I [illegible] recommends [illegible] Dissertations on Several Subjects [illegible]

Lind described this source of death in the [illegible] *Edinburgh Monthly Magazine* of May, 1751 [illegible] passing that James Hardy, a surgeon of Barnstaple [illegible] (1778) put forward this action of acid on the lead glaze of [illegible] vessels as the way in which cider became impregnated with [illegible] attempted to modify to this extent the accepted view of Sir [illegible] that the impregnation of cider with lead, which he [illegible] cause of Devonshire colic, took place in the presses. [illegible] that the danger from keeping cider in glazed earthen [illegible] well known to Baker. [illegible] followed the practice of [illegible] other detail, namely in advising sauerkraut as a prophylactic [illegible] preparation was made from yellow cabbage, the leaves of [illegible] in November into thin slices and strewn in layers [illegible] then covered with salt. According to Lind if the [illegible] preserved are washed, their virtue is the same as [illegible] the garden.

Most unfortunately for the Navy forty-one years [illegible] recommendations as to the use of lemon juice [illegible] effect. The state of affairs in 1791 is thus described [illegible] "for the prevention of scurvy the British Navy is [illegible] provided with sauerkraut, elixir of vitriol, malt and essence [illegible] before fermentation)"; of the first he says that [illegible] which it has cost the Government [illegible] of the [illegible] suggested by Mead and largely used in the Navy [illegible] free dilution to the juice, he adds that it is [illegible] that it is useless. He recommended fresh vegetables [illegible] as lemons, oranges, and limes, but threw cold [illegible] advocacy of the preserved juice of lemons and oranges [illegible] that it failed in the hands of the famous Captain Cook [illegible] to the southern hemisphere in 1773-4, and others [illegible] Milman (1762), and that it underwent fermentation and [illegible] John Pringle, however, argued that the failure [illegible] the insufficient quantity used, and tried, though unsuccessfully [illegible] his friend Captain Cook to give it a further trial [illegible] curiously unwilling to accept its value [illegible] treated with vinegar. After, just as before, Lind's [illegible] treatment, various methods of curing and preventing [illegible] put forward, some of these being modifications of old [illegible] he mentioned a mixture of vinegar and [illegible] (Paterson) [illegible] (Fairfoul), crystallized citric acid, spruce [illegible] porter and cider, and several writers stated that [illegible] for grog was followed by diminution of scorbutic symptoms.

It was Sir Gilbert Blane's powerful influence that [illegible] brought Lind's recommendations into official use. [illegible] medicine had in 1782 been instrumental in curing [illegible] on twenty-eight ships of the line, by means of [illegible]

[1] Trotter, T., Observations on the Scurvy, Second edition, [illegible] London, 1792.

Paterson, D., A Treatise on Scurvy, 17[illegible]

Thomson, F., An Essay on the Scurvy, London, 1[illegible]

oranges and as the outcome of his advice in 1793 to Sir Alan Gardner every seaman in H.M.S. "Suffolk" during a voyage of twenty three weeks in 1794 without touching at any port received two thirds of a three ounce of lemon juice and 2 oz. of brown sugar daily with the result that scurvy did not appear on the ship. Blane, who had thus tested both the curative and prophylactic effects of lemon juice, gave the most full and generous credit to Lind, and was most emphatic that nothing in the least degree could compare with it. In 1795, a few months after Blane had been appointed a Commissioner of the Board of the Care of Sick and Wounded Seamen, an Admiralty order enjoining the use of lemon juice was issued. It is rather pathetic that Lind who died on July 13, 1794 did not live to see the full fruits of his labours. The effect of this Admiralty order was almost magical; scurvy at once practically disappeared from the Fleets and Naval Hospitals, and the annual average of the naval sick sent to naval hospitals was halved. Thus, in 1797 Earl Spencer, First Lord of the Admiralty, being at Portsmouth visited Haslar and was anxious to see scurvy, but there was no case in the hospital. This may be contrasted with the state of affairs in 1779 when the Channel Fleet after a ten weeks cruise in the Bay of Biscay returned to Portsmouth with 2,400 cases of scurvy. It is noteworthy that this great step in naval preventive medicine which took so long to accomplish almost coincided with the publication of Jenner's long and patient work on vaccination (1798).

It may not fully seem strange that Lind's recommendations were so tardily adopted, for they were neither boycotted nor ignored, reference being made to them, though sometimes rather coldly, by most of the numerous contemporary writers on scurvy, and, as has already been mentioned, his treatise went into three editions. Trotter, who praised Lind during his lifetime, is quoted on page 190 in 1803 expressed his surprise that Lind had had so many opportunities of examining cases of scurvy after death and went on to say "the plain truth of the matter is, his method of cure was imperfect, for a man dying of scurvy is not known at the present day". It certainly is grossly unfair to saddle Lind with the blame for the results of the failure to carry out his injunctions for the prevention of scurvy. Moreover, in a previous sentence Trotter mentioned that on one occasion scorbutic sailors died while being conveyed from Spithead to Haslar. It does not appear that Lind's personality was likely to arouse antagonism, for the records of Haslar show that he was pre-eminently a man of peace. He had been a surgeon in the Navy and there is no reason to suppose that his appointment to an important office such as Haslar aroused resentment or passive resistance among the medical officers of the Navy. Herbert Spencer[1] used the interval of forty-two years which the Admiralty allowed to elapse before acting on Lind's recommendations as an apt illustration of the inertia and torpor of administrative bodies. Perhaps the real explanation is merely that Lind had to meet with the same prejudice and opposition that great reforms, for example, inoculation, vaccination and Listerism, commonly encounter.

Another practical reform in naval hygiene made by Lind was his simple method of obtaining potable water by distillation of sea water. It had long been known that distillation deprived sea water of its salt

[1] Spencer, *Study of Sociology*, fifteenth edition, p. 1[illegible], London, 1889.

but as the distilled water always had a disagreeable taste, which was supposed to be due to bitumen and a spirit [illegible] such ingredients as Lapis infernalis [1] and calcined bones (Appleby, 1751), soap lees (Butler) or powdered chalk (Stephen Hales) were added to the sea water as preventives In practice however these had grave disadvantages. Lind pointed out that the burnt (empyreumatory) taste which is common to all distillates, especially the first few ounces, quickly disappears on exposure to the air and he accordingly dispensed with the addition of any ingredient to the sea water before distillation In 1761 he demonstrated his method in Portsmouth to Mr Hughes the resident Commissioner of the Navy, and in May 1762 transmitted a full account of it to the Royal Society He employed the ordinary ship's boiler fitted with a pewter still head and a worm placed in a closed cask (worm tub or cooler) full of cold sea water which could be changed and when warm utilized to fill the boiler Fortune, however did not smile on his efforts for the improvement like many discoveries was not only claimed by others but stated not to be original and to have been known to Sir F Bacon and Sir Richard Hawkins It must have been very galling when four years later Poissonnière a French author of a treatise on diseases of seamen received a considerable pension for the same improvement and again in 1772 when Irving, a surgeon in the Royal Navy was awarded a grant of £5 000 from the House of Commons for an inferior apparatus consisting of a large tin tube 6 to 8 in in diameter and 7 to 8 ft long like the funnel of a stove which was attached to a ship's copper and kept cool with mops, but was not provided with a worm. By an irony of fate Lind was placed on the Board which reported favourably on Irving's method and after first refusing gave in and signed the report That Lind's priority which Sir Gilbert Blane subsequently endorsed should have been thus ignored is rather puzzling for according to Lind the Lords Commissioners of the Admiralty published the second edition (1762) of his essay "On the most Effectual Means of Preserving the Health of Seamen" as an honour "upon account of the important discovery I had then made of rendering sea water perfectly fresh and wholesome by a simple distillation "

Under the attractive title of "A Means of Preventing a Want of Provisions at Sea," Lind described the result of an inquiry to discover the most nutritious substance which from its small bulk the ease with which it could be prepared as food and its stability might be carried on board ships as a kind of emergency ration in addition to the ordinary victualling The articles he recommended were powder of salep (meal from the dried tubers of some orchidaceous plants) and portable soup which provide the maximum amount of protein and carbohydrate in the minimum bulk An ounce of powdered salep and an ounce of portable soup dissolved in two quarts of boiling water made a rich thick jelly and provided enough food for a man for a day

The familiar uniform of sailors appears not to have been established until 1857, although Clowes [2] quotes memoranda dealing with the naval

[1] Lapis infernalis was a synonym for nitrate of silver and Lapis infernalis alkalinus for caustic potash which was presumably the ingredient used by Appleby

[2] Clowes "History of the Royal Navy" 1901 vol vi p 210

[illegible] officers before this date, the earliest being in 1825 Before the [illegible] of the uniform the captain of each ship determined the style [illegible] slops —often somewhat piratical—of his crew It is [illegible] to note that Lind[1] urged that the seamen of His Majesty's [illegible] be put into a uniform sea habit with some little movable [illegible] by which it might be known to what ship they [illegible] object was to ensure cleanliness and to avoid infection [illegible] filthy articles of clothing This suggestion was endorsed by [illegible] elaborated by Trotter[2] who proposed that the uniform should [illegible] jacket a waistcoat of white cloth trimmed with blue [illegible] and a small, round waterproof hat with a narrow belt [illegible] should be printed the name of the ship Trotter urged that [illegible] the sanitary advantages the adoption of such a uniform [illegible] more difficult

[illegible] differentiated at that time formed a very large [illegible] cases sent from the fleet to Haslar thus in the two [illegible] to July 1760—out of 5 743 patients admitted 2 174 [illegible] fevers the next largest item being 1 1[illegible] victims [illegible] subject of fevers the spread and prevention of infec[illegible] naturally attracted Lind's practical and [illegible] He laid much stress on the importance of fresh air and [illegible] the most airy wards in the hospital should [illegible] He also pointed out that when fevers became [illegible] tents or separate huts in open fields are far [illegible] support of this open air method of treatment [illegible] which there were so many fever patients that [illegible] and were therefore thought to be rather [illegible] of these however recovered whereas the mortality [illegible] wards was very high He expressed [illegible] allotted to the sick on board ship, [illegible] part of the gun deck called the bay which is the most [illegible] part of the ship or what is nearly as bad [illegible] and characteristically ready with a practical [illegible] that in warm weather the most suitable place for the sick was [illegible] which if necessary, could be protected from rain [illegible] What [illegible] as to the value of fresh air and cleanliness [illegible] the spread of infection he fully realized that these [illegible] to destroy the infective agent and for this purpose [illegible] tobacco burnt with junk or by charcoal [illegible] sulphur or arsenic

[illegible] striking jail fever (typhus) as it was common [illegible] often introduced by impressed men brought from Newgate and other prisons He says that it is a mistake to consider that [illegible] for it is sometimes confined to a very narrow [illegible] and he instances two marines who contracted [illegible] from sleeping in the same bed Examples are [illegible] that the infective agent is carried in filthy clothes and rags

[1] [illegible] Effectual Means of Preserving the Health of Seamen [illegible] p 7

[2] Trotter [illegible] Nautica 1797 vol [illegible] p 48

[illegible] to the [illegible] it was [illegible] by the [illegible] of the so-called [illegible] ships for [illegible] nearly [illegible] to the [illegible] so as to prevent [illegible] the ships.

[illegible] were highly valued by [illegible] the assistance which [illegible] continued that [illegible] was always better [illegible] in the provision of [illegible] the body [illegible] He stated that [illegible] it is now [illegible] I gave [illegible] almost [illegible] 1833 [illegible]

[illegible] the country [illegible] have no [illegible] time [illegible] that these views [illegible] of debility which [illegible] rather than [illegible] Although [illegible] of tropical [illegible] and [illegible] outcome of personal experience and observation [illegible] other writings.

Lind was a careful though somewhat credulous and unnecessarily

prone in view of his wide experience to quote others in support of his conclusions. As a result his works though scholarly are sometimes rather laboured. His strong point was not originality, but sound common sense which enabled him to see the essentials clearly and to adapt or modify existing means to meet difficulties in a thoroughly practical manner. If we accept Broussais's dictum that "the real physician is the one who cures," Lind's services to the Navy entitle him to a high place and a lasting fame in our profession. The following estimate of Lind during his lifetime from the pen of his somewhat critical contemporary Trotter may fitly conclude this slight sketch. "The leading trait of his professional character has marked him the man of observation. When he first published his book he had no doubt many authors to consult; but their facts were often distorted, their theories absurd, and their practice empirical, so that much was left to himself; and when he came to be Physician to Haslar Hospital he seems to have soon formed his own opinions. Of great medical abilities that have attended military services the army of this country can boast of a Pringle, a Cleghorn and a Munro and some others who have written since (the) last war but the name of Lind stands alone in the Navy. Amidst the few advantages his situation afforded him for study the spirit of observation never forsook him and his works comprehend the best study of climate that has yet been published."[1] Elsewhere Trotter speaks of him as "the father of Nautical Medicine."

[1] Observations on the Scurvy, Introduction p. xxii, Second edition 1792.
Medicina Nautica, 1797, vol. i, p. 10.

Clinical and Practical Notes.

AN OUTBREAK OF ENTERIC DUE TO OYSTERS.

By Fleet Surgeon H. W. B. SHEWELL, M.A., M.B. [illegible]
Surgeon C. DEVEREUX MARSHALL, F.R.C.S. [illegible]

The fact that oysters may be contaminated with se[illegible] known and recognized, and so many attacks of enteric fe[illegible] traced to this cause that no proof of this method of th[illegible] disease is required. As a somewhat serious outbreak [illegible] recently occurred in H.M.S. "Euryalus" it has been th[illegible] to publish the facts, so that in future such precautions [illegible] should be taken to avoid similar outbreaks.

On October [illegible] 1911, the ship being in Portsmouth Harb[illegible] of oysters was ordered to be delivered from a well kn[illegible] monger. Thirty dozen were purchased and during the [illegible] were opened ashore and brought off. They were served [illegible] the Ward Room at 7.30 p.m., when most of the officers and [illegible] servants partook of them. At the time nothing unusual [illegible] anyone who ate them and there was nothing to cause [illegible] condition. The next day the ship proceeded to sea.

Within forty-eight hours of eating the oysters [illegible] attacked with severe gastro-enteritis. There was [illegible] vomiting, and their condition was such that [illegible] be taken off duty and put on the sick list. Several [illegible] among the ward room servants, and within the next [illegible] appeared. After rest in bed on slop diet and the usual [illegible] symptoms subsided, but in many cases recurrence of [illegible] took place as soon as the patients resumed their usual [illegible]. On careful inquiry it was found that not a single pe[illegible] from eating the oysters was affected, and two only escape[illegible] thirty who had taken them. It was fully three and a hal[illegible] all the patients were well, and during that time most of them [illegible] several days on the sick list.

On October 28 one of the officers, a lieutenant, who had [illegible] affected, showed symptoms of fever and general [illegible] peratures ranging from 102° to 101° [illegible] following day the diagnosis of enteric fever was made. T[illegible] midshipman and a marine servant [illegible] complain[illegible] symptoms. In each case enteric fever was diagnosed. [illegible] it was decided to land the three cases, and [illegible] taken ashore and placed in the Royal Naval Hospital [illegible] in each case the diagnosis was confirmed. The ship [illegible]

On Friday, November 6 (seven days after landing the [illegible]) a marine officer was taken ill with abdominal symptoms [illegible]. Although his symptoms differed somewhat from the other cases [illegible] was treated for enteric. The next day he was worse [illegible] complained [illegible] a good deal of pain over the hepatic region and at [illegible] became [illegible]

[illegible] On November [illegible] arrangements were made [illegible] taken up to the Royal Naval Hospital, Stonehouse [illegible]

[illegible] showed typical signs of the disease within eighteen [illegible] the oysters, but the fourth case did not complain of [illegible] after having done so. They had, however, [illegible] gastro-enteritis previously.

[illegible] the usual course of enteric. The midshipman [illegible] though seriously ill, never gave rise to any undue [illegible] had a most severe attack, and several times he [illegible] collapse (five to six weeks after he had [illegible] life was despaired of, and he was thought [illegible] occasion. However, he got better, and [illegible] considered to be out of danger.

[illegible] from the others. The incubation [illegible] above. The temperature was more [illegible] the others. A day or two after he [illegible] jaundice and tenderness [illegible] He certainly had cholecystitis. The [illegible] though positive in the others [illegible] which was then diagnosed [illegible] and after about five weeks in [illegible]

[illegible] lieutenant had a bad attack of [illegible] had a similar attack two [illegible] severely from gastro-enteritis [illegible] they had eaten the oysters [illegible] the oysters were the cause of [illegible] probable that such was the case.

[illegible] that the oysters were the cause of the [illegible] the Medical Officer of Health, Portsmouth [illegible] the question. He very kindly [illegible] gave us the following information:—

[illegible] been dredged from [illegible] Harbour [illegible] infection as several outbreaks of enteric [illegible] to oysters taken from its various creeks [illegible] that oysters taken from this [illegible] contaminated inner [illegible] three weeks [illegible] In this case there is evidence that [illegible] Oysters from the same source were [illegible] Professor Klein carried [illegible] *Bacillus typhosus* [illegible] contamination [illegible] oysters [illegible] from being brought to [illegible] there is no law to prevent them [illegible]

[illegible] and it assumes still [illegible] ships are constantly [illegible] there is no guarantee that [illegible] the greater part of a [illegible] the large number of officers on

the sick [illegible] the work of the ship [illegible] with [illegible] and had the ship been called upon [illegible] action [illegible] have been [illegible].

If, as appears to be the case, [illegible] things as [illegible] infected oysters [illegible] instructions should be issued to [illegible] the [illegible] of the danger and forbidding [illegible] being brought [illegible] as an article of food.

— —

A POSSIBLE CASE OF TYPHOID INOCULATION FEVER

By [illegible]

[illegible] Hospital [illegible]

An interesting case [illegible] recently occurred in [illegible] hospital. [illegible] in that the symptoms [illegible] certain [illegible] Widal reaction [illegible]

H. [illegible] was admitted to hospital November [illegible] 1911 with the following history:—

He received an antityphoid inoculation on November [illegible] several days afterwards [illegible] slight [illegible]

On November 18th he began to feel worse and two days later [illegible] sick with severe headache and general malaise. A [illegible] disappeared the next day [illegible] present on the body [illegible] The headache gradually became worse, and on November [illegible] developed, the temperature rising to [illegible] The next day the [illegible] reached [illegible] and remained elevated three [illegible] normal until admission to hospital.

On admission on November 30 the symptoms and physical signs were such as one would expect to be present during the [illegible] of typhoid fever. The tongue was thickly furred in the centre [illegible] edges. The abdomen was [illegible] and [illegible] on palpation. The spleen was not palpable, but the liver dullness extended two fingers breadth below the costal margin. [illegible] of congestion were present at the base of the right lung, [illegible] case in enteric fever, but they did not [illegible] for the appearance of the patient, the severity of the general symptoms, the [illegible].

On December [illegible] the stools, which had previously been [illegible] coloured, became liquid and tinged with blood, but [illegible] the symptoms improved and the temperature fell to normal [illegible] the fall of temperature being by crisis rather than by lysis.

A Widal reaction performed on December [illegible] gave a negative result. In an article entitled "The War and Typhoid Fever" (*British Medical Journal*

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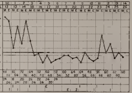
[1] Note.—[illegible] were reported to the Medical Department of the Admiralty [illegible] this subject. [illegible]

Novem[illegible] [illegible] William Osler states that symptoms suggestive of enteric [illegible] itself may follow inoculation He quotes two case[illegible] the injection was followed by an illness not to be dist[illegible] fever and which was considered to be a typical t[illegible] as such

In the [illegible] of January 9, 1915, an interesting case of enteric fever [illegible] autopsy is reported by Major E A Bourke R A M C and Dr S[illegible] Rowland In this case the patient had received two inoculations the first in March 1914 and the second a few days before the onset of his fatal illness The well known symptoms of enteric fever were absent and the diagnosis was only established in the fourth week of the illness when the urine was found to be full of typhoid bacilli in agglutinated clumps



The authors attribute the absence of the usual symptoms of enteric fever to the masking effect of the protective inoculations The result of the Widal reaction is not stated but a positive reaction would probably have resulted from the injection in March and would not have been of any diagnostic value

In view of the unfortunate and dangerous prejudice that exists in the popular mind against anti typhoid inoculation, we should be very cautious in attributing to the inoculation any illness which may happen to follow this therapeutic measure.

As Fleet Surgeon P W Bassett Smith C B, says in his paper, on "Typhoid and its Prevention" in the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE (January 1915) such cases "in the popular mind are certain to be put down to the inoculation and are distinctly unfortunate" especially as these anti typhoid vaccines have been used as a therapeutic agent with marked benefit

[illegible] the case to which Sir William [illegible] The [illegible] in this case was negative. [illegible] five to ten days after [illegible] result has persisted after [illegible] thus Maverick [illegible] W. Goodall [illegible] the case of a youth aged 16 who [illegible] occasions in eight months [illegible] never showed the presence [illegible] of his brothers gave a positive [illegible] with one of the serums [illegible] this connection that a negative W[illegible] percentage [illegible]

[illegible]

[illegible]

[illegible]

The [illegible] the history of the [illegible] came to the [illegible] On [illegible] ankles and legs [illegible] blue [illegible] at the apex [illegible] was [illegible] the sick list and [illegible] with [illegible] It was thought [illegible] be due to the cardiac condition [illegible] marked oedema could be accounted [illegible] particularly as the patient did not [illegible] cardiac discomfort and the history [illegible] a general tonic which included [illegible] general condition improved for [illegible] anaesthesia over the anterior border [illegible] both thighs. The knee reflexes which [illegible] exaggerated [illegible]

somewhat sluggish. To prevent further advanced symptoms he was sent to the Government Civil Hospital at [illegible] on arrival at that place.

On December 5, two days after the above man reported himself, two other cases came to the sick bay also complaining of swelling of both legs. Beriberi was then suspected and an examination of the ship's company was made. Seven cases besides these three were found to have oedema of both legs, some in a fairly marked degree and some very slight. Both these two cases which reported themselves on December 5 were placed on the sick list, but the seven cases found on inspection were given light duty as no other symptoms beyond the oedema of both legs developed.

This now made three cases in all on the sick list and seven cases on light duty. One of the cases of December 5, a boy aged 17, developed alarming symptoms, and in four days had complete loss of knee jerks, marked tenderness of the calf muscles, anæsthesia over the soles of the feet, anterior borders of the tibiæ, inner sides of both thighs, finger tips and over the thenar area of both hands. He was only able to pick up a pin with great difficulty. The heart was dilated and the first sound at the apex blurred. He was able to stand up, but could hardly walk. His gait was typical of peripheral neuritis. On arrival at Aden he was sent to the European General Hospital.

The other case of December 5 improved considerably, the oedema disappearing, and as no further symptoms developed he was discharged to duty after being on the sick list for five days.

On investigating the reason of the outbreak no definite cause could be ascertained beyond perhaps the lack of fresh vegetables for some considerable time and mouldiness of the flour.

I could attach no importance to rice as these men very seldom eat it. Moreover, it is [illegible] rice and is practically the only food eaten by the natives every day. All these ten cases came from the same mess (i.e., the seamen's mess), the petty officers, chief petty officers, and all other messes remaining exempt. As far as could be ascertained this seamen's mess did not eat of food other than that supplied to the whole of the European ship's company.

On going into each article of food in detail the flour was found to be mouldy, musty, and had a yellow hue. The men stated the bread was very mouldy and they were hardly able to eat it.

Detailed microscopical examination showed that there were some rice grains mixed with the wheat and also the following parasitic and fungoid growths:—

(a) Weevil (*Calandra granaria*).

(b) A large amount of *Claviceps purpurea*.

This last named fungus produces discoloured bread and furnishes the bread with a sour odour. All this flour in tins which were obtained at Bombay in August last was condemned and fresh flour in bags obtained.

Regarding the position of the mess, it is on the foremost troop deck. This ship in peace time does a considerable amount of trooping so that this mess may be sometimes occupied by European and sometimes by native soldiers, but no lascars or native stokers of this ship have ever occupied the mess. When the ship arrived at Suez fresh vegetables were issued every day as a ration and a considerable amount was taken on board as a stock while the ship was at sea. Lime juice was issued

every day, and [illegible]
to issue from [illegible]
changes each [illegible]

The scanty [illegible]
Others [illegible]
thoroughly [illegible]

Inspection [illegible]
time showed [illegible]
in some cases [illegible]
marine, who [illegible] symptoms [illegible]
and he developed [illegible] of the [illegible]
and there was [illegible]
the cardiac symptoms [illegible] thought necessary to [illegible]
of the ship [illegible] Royal Naval Hospital [illegible]
the same time [illegible] the latter [illegible] to
improve [illegible]

This makes [illegible] cases still remaining
in the ship. All [illegible] improved [illegible] to the
improvement in [illegible] the Commander-in-Chief
those cases [illegible] discharged [illegible] the first
opportunity.

It will be seen that only one case developed serious symptoms and
well marked [illegible] with complete [illegible] the others
showing [illegible] both legs and a tendency to [illegible] dilatation
[illegible] there [illegible] murmur
[illegible] Some com-
plained [illegible] of the legs and [illegible] others
[illegible] Royal Fleet [illegible] nothing,
[illegible] Company stated that [illegible] of the legs
before [illegible]

None of these cases had albumin in the urine [illegible]
[illegible]

The [illegible]
[illegible] perceptible [illegible]
with legs [illegible] symptoms
[illegible] This
[illegible] symptoms to
have [illegible] and to be transferred from the
ship [illegible]

INTRACRANIAL DISEASE AND GLYCOSURIA, NOTES ON TWO CASES.

By [illegible]

[illegible]

The following [illegible] which occurred
at Royal Naval Hospital [illegible] during 191[illegible] appear to be of interest
especially from a diagnostic point of view [illegible] was
a prominent feature.

The presence of sugar in the urine has been noted in cases of cerebro-
spinal fever, but is apparently uncommon. Dr. Ormerod in his article
on "Epidemic Cerebrospinal Fever" in Sir Clifford Allbutt's "System of

Medicin[illegible] that glycosuria has been rarely observed, while Osler ("Princ[illegible] Medicine") and Dr E W Goodall (*Med Ann* 1911) [illegible] this symptom has been noted in some instances

[illegible] the second case here recorded—one of cerebral, or rather of [illegible] haemorrhage—authorities (Ferrier Osler Tooth), [illegible] occurrence of glycosuria in destructive lesions of the brain [illegible] haemorrhage and in lesions of the fourth ventricle [illegible] books at my disposal I have been unable to find any reference [illegible] symptom in purely intrameningeal bleeding Sir William Osler [illegible] that the abundant presence of albumin and sugar in the [illegible] cerebral apoplexy is an unfavourable symptom

[illegible] leading signalman aged 20 was admitted into hospital [illegible] having been suddenly taken ill on board his ship H M S [illegible] George V) three days previously, with vomiting [illegible] some fish which he had eaten the night [illegible] after he came under observation on [illegible] the temperature which had been at normal [illegible] the patient becoming in the words of the medical [illegible] restless and noisy and at times rather delirious [illegible] hospital the patient was in a semi conscious condi[illegible] able to answer questions sensibly, and [illegible] but as soon as he was left he relapsed into a [illegible] His temperature on admission was [illegible] was of full volume and high tension frequency 102 [illegible] 36 The tongue was coated with a [illegible] physical signs of disease could be detected in the heart [illegible] viscera but loud crepitations, with diminished [illegible] percussion were present over both lungs Examination of [illegible] threw no light on the diagnosis the pupils were [illegible] normally there was no strabismus or head retraction, and [illegible] reflexes were unaffected No rash was present on the skin

I [illegible] inclined to regard the case as one of pneumonia with secondary [illegible] of the meninges, although the absence of any of the [illegible] of the latter affection rendered the diagnosis obscure [illegible] the urine it was found to contain a large quantity of [illegible] Fehling's solution Johnson's test positive, and [illegible] the presence of which added a further element of [illegible] was suggested but this was negatived [illegible] diacetic acid was present There [illegible]

The [illegible] continued during the next two days the respirations [illegible] frequency becoming deeper and almost stertorous [illegible] the patient became increasingly cyanosed and orthopnoeic [illegible] signs of consolidation of the lower lobes of both lungs were [illegible] On the 26th phlebotomy of the left median basilic [illegible] performed with, however, but little effect either in quieting the [illegible] relieving the respiratory embarrassment, and in spite of all [illegible] done death occurred on the evening of March 27, two [illegible] admission

[illegible] autopsy performed the day after death the case was found to [illegible] one of cerebrospinal meningitis On opening the skull and removing

the dura mater the pia-arachnoid [illegible] gested and the superficial veins [illegible] with blood. Al[illegible] of the larger vessels were pa[illegible] no purul[illegible] which was more abundant on the [illegible] than on the [illegible] In view of the occurrence of the [illegible] increasing to [illegible] the inflammatory changes were [illegible] upper part [illegible] medulla and lower part of the p[illegible] exudate co[illegible] these parts and surrounding the [illegible] their origins. The ventricles contained no pus or [illegible] the [illegible] much congested in appearance. The [illegible] itself presented no pathological changes to the [illegible] lobes of both lungs were deeply engorged and [illegible] fully accounting for the physical signs observed during [illegible] No [illegible] of disease of the other thoracic or abdominal viscera was found.

Stained smears of the meningeal exudate showed a few diplococci, not intracellular. Culture on agar gave a growth of a Gram-negative diplococcus resembling the *Diplococcus intracellularis meningitidis*. Surgeon G. B. Scott, R.N., of the Royal Naval Hospital, Chatham, kindly confirmed the diagnosis by cultural methods, the organism producing acid and gas in maltose and dextrose after [illegible]

The second patient, a private of Marines, aged [illegible] admitted on the evening of April 7, with a history of having fallen down [illegible] on board H.M.S. "Thunderer" a few hours previously. He was [illegible] diately seen by a medical officer who reported that he was at [illegible] semi-conscious condition, but soon lapsed into unconsciousness. He vomited twice before becoming unconscious, the vomited matter [illegible] ing of cocoa. The corneal reflex was absent, the pupils contracted, inactive and slightly unequal; there was no strabismus. The pulse was irregular, slow and of poor volume and the respirations were slow and laboured. When admitted into hospital the patient was in a comatose state with contracted pupils, stertorous breathing and full high-tension pulse.

These symptoms occurring in a young patient apparently in excellent health and with no history of antecedent syphilis or other serious disease suggested a diagnosis of cerebral hæmorrhage, but the possibility of acute narcotic poisoning had to be considered. A further difficulty, however, was introduced by the fact that on testing the urine, which was drawn off by catheter, it was found to contain abundance of glucose but, as in the first case, no acetone bodies or albumin. A diagnostic lumbar puncture was performed, but although the needle undoubtedly entered the spinal space the puncture was "dry," no fluid being obtained.

The stomach was washed out with a solution of permanganate of potassium, and as the patient was becoming increasingly cyanosed and dyspnœic 20 oz. of blood were withdrawn from the left median basilic vein. At midnight the pulse suddenly became feeble, bloodstained froth issued from the mouth, and after a few spasmodic respiratory efforts the patient died.

A post-mortem examination was performed the following day, which [illegible] the immediate cause of death and also the explanation of the glycosuria [illegible] were found in a large retrameningeal hæmorrhage at the base of the brain. A large dark, firm clot was found covering the base of the pons and medulla oblongata, extending downwards into the spinal canal [illegible]

upwa[illegible] The effused blood occupied the [illegible] being apparently healthy. The bleeding [illegible]. The cerebral ventricles contained [illegible]. No predisposing cause of the h[illegible]. The kidneys were rather darker than usual [illegible] appearance. The heart was not hypert[illegible] atheromatous changes.

In th[illegible] diagnosis was rendered more difficult th[illegible] in the urine. Diabetic coma [illegible] absence of the ferric chloride reaction in the [illegible] absence of acetone bodies in the [illegible] the pre[illegible] secondary importance merely [illegible]ting pressure [illegible] of the fourth ventricle.

PENETRATING [illegible] WOUND OF THE THORAX AND ABDOMEN.

(WOUND OF [illegible], STOMACH, LIVER AND [illegible].)

By [illegible] R.N.

G[illegible] the Royal Naval Hospital, Plymouth, on December [illegible] accidentally shot. On admission [illegible] an entrance wound of a bullet [illegible] lower of the fourth rib right side. No haemoptysis [illegible] symptoms. X-ray examination revealed the bullet [illegible].

One hour after [illegible] a little blood and became rigid and tender in the upper [illegible].

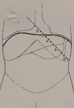
I opened the abdomen [illegible] through the left rectus. Two wounds in the stomach were [illegible]. Blood welled up from the outer side of the abdominal [illegible]. The left hypochondrium was found to contain some clots. T[illegible] examined and found to be lacerated at the lower end with the bullet partially embedded in its parietal surface. An incision was made outwards below the costal arch and the spleen exposed. The abdomen was closed. Rectal saline was given. He seemed to progress with[illegible] complication until December 7, when he complained of pain in the precordial region; a marked pleuritic friction was heard over the [illegible] track of the bullet. Pulse 120 to 130, respiration 3[illegible].

December 8. P[illegible] and [illegible] marked. Pulse 130 to 138, [illegible] irregular. [illegible] the lungs freely; no dulness found.

December 10. Abdominal wound septic; stitches had given way at the upper part.

December 11. Abdominal wound more open, with protrusion of [illegible]. Pulse rapid and irregular, and heart sounds not so distinct.

December 20. A diffuse swelling at the right side of the neck, [illegible] triangle, the hollow under clavicle obliterated. Veins pro[illegible] lymphatic glands enlarged.



December 30 [illegible] protrus[illegible] alenor All the swel[illegible] about the [illegible] feet dulness to right side of the stern[illegible] [illegible]

January 1 [illegible] to 140 respirat[illegible] to 10, abd[illegible] clean Very restless He continued in this condition until [illegible] when he died

Post mortem —Bullet entered at the upper border of the [illegible] wounded slightly the right lung entered the pericardium [illegible] through the liver and stomach, and lodged in the spleen [illegible] pericarditis present and was the cause of his death The [illegible] stomach wounds had healed

REMARKS

On admission the patient had no symptoms that called for operation One hour after entry the vomiting of a little blood and pain and rigidity in the epigastric region called for immediate surgical interference The bullet wounds of the stomach were quickly found The fact that the spleen was still bleeding necessitated its removal The bullet was found at the operation semi embedded in the parietal surface of the spleen, vide fig 2 It would appear as if, after the bullet had wounded the lower end of the spleen it passed on and struck a rib which deflected it back again into the spleen

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A METHOD OF GROWING YEAST FOR MAKING BREAD

By Surgeon L. L. ATKINSON R N

The following account of a method of growing yeast for breadmaking may be useful in ships whose stock has run low or in any establishment where a fresh stock is not obtainable At present and for some time past no great reliance can be placed on the supplies of German yeasts which are sold commercially They frequently produce a weak and ineffective yeast and often die out very quickly

The process depends upon the almost universal presence of yeasts in certain cereals In the British Antarctic Expedition of 1910 to 1913, a culture such as is described below was started, and it lasted with great success for over two years

The Medium

The following ingredients are mixed together and brought to the boil 1 lb of malt 1 oz of hops ½ lb of bran ½ lb of sugar 1 gallon of water

The whole is then allowed to simmer for half an hour The medium is next allowed to cool in any receptacle slowly until 104° F is reached A large handful of bran a small handful of malt and a small handful of sugar is then added The whole is then placed in a warm place and allowed to grow Care must be taken not to allow the temperature to rise above 110° F or to sink below blood heat At the end of twenty four hours the yeast will be sufficiently active to use for raising dough

It is a good plan to keep this original growth and to subculture for daily use with a similar medium The quantity necessary is about 1 pint of the old culture to a gallon of the medium The yeast to be

[illegible] [illegible] first normally for about [illegible] [illegible] be carried on longer [illegible] [illegible] this can best be done by [illegible] [illegible] part of potatoes (2 lb) [illegible] chopped [illegible] 3 oz of hops 1 handful [illegible]

Boil [illegible] [illegible] each a 104° F a subculture can be made [illegible] [illegible] four hours growth it is again subcultured to the original [illegible]

The [illegible] [illegible] quality of German yeast has been marked Where before [illegible] 6 oz to raise 300 lb of bread it now needs at least 10 oz [illegible] [illegible] often uneven and becomes sour

The method [illegible] [illegible] closely followed and was used in making the bread for over two [illegible] the Hut in the Antarctic It has also been adopted for making [illegible] bread in the 'St Vincent' for several weeks now A microscopic [illegible] [illegible] will often give information as to the nature of the [illegible]

SPENGLER'S PIKRIN METHOD OF STAINING TUBERCLE BACILLI

[illegible] ROBERT M BIGGALL R N (Reserve)

[illegible] Officer to the Queen Alexandra Sanatorium [illegible] Switzerland

[illegible] of this method I am indebted to Dr Hugh H Carleton, Medical Superintendent of the Queen Alexandra Sanatorium, Davos [illegible]

[illegible] undoubtedly more delicate than an ordinary Ziehl Neelsen [illegible] frequently a sputum examined by it will be returned [illegible] positive when it has been returned negative by the latter This was found [illegible] the case in a series of investigations carried out in the Queen Alexandra Sanatorium

For diagnosis it is probably better to follow the Ziehl Neelson routine first, and if the results should prove to be negative to use the Pikrin method in preference to antiformin

The routine is as follows —

(1) Make films of sputum

(2) Dry with gentle heat over flame

(3) Stain in the usual way with carbol fuchsin, taking care not to overheat

(4) Stain with Pikrin solution renewing the solution several times until the red becomes yellowish

Pikrin solution	Esbach's solution	Half
	Absolute alcohol	Half
Esbach's solution	Picric acid	10
	Citric acid	20
	Water	1 000

(5) Decolorize with nitric acid 15 per cent for one minute

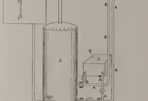
(6) Counterstain with Pikrin solution

(7) Wash with water very quickly and dry on blotting paper at once

ADAPTATION OF STERILIZER FOR USE WITH STEAM GEYSER

By Fleet Surgeon ADRIAN A. FORRESTER, M.D., R.N.

The instrument sterilizer supplied is boiled by means of a spirit lamp and this I do not think is desirable in a first aid [illegible] station. It occurred to me that could the sterilizer be boiled by [illegible] it would have many advantages. I planned the arrangement shown in the drawings which acts in a most satisfactory manner. The design was carried out by the engineering department of the ship. The sterilizer can at any time be disconnected and used as before i.e. boiled by [illegible] lamp.

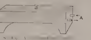


[illegible] B exhaust steam. C steam geyser. D sterilizer. [illegible] this [illegible] in the ordinary manner as designed [illegible] the instruments.

Description of Method of Converting

Half inch copper piping (tinned) is led as a double coil round the [illegible] of the sterilizer in the space between the side and the [illegible] in which the instruments are placed. The ends of the piping

are brought out through one end [illegible] and finished with [illegible] shaped joints. These joints [illegible] the steam supply [illegible] geyser, the other to the exhaust [illegible] ½ in. funnel [illegible]. Steam cocks are fitted to each [illegible] steam turned on or off as required. The sterilizer is [illegible] by means of a bracket. It is filled with water in the ordinary [illegible] turned on and it boils in from three to four minutes.



[illegible]

The advantages are:

(1) No danger from fire [illegible] leaving station in action.

(2) Boils in three or four [illegible]

(3) It can be boiled at the [illegible]

(4) It can be boiled apart from [illegible]

(5) It can be disconnected [illegible] and used [illegible] lamp).

(6) It is absolutely under control and there [illegible] blowing up.

(7) There is nothing to get out of [illegible] an [illegible]

(8) Steam will probably be available in action [illegible] circuits have gone out of gear.

(9) By superimposing the [illegible] container dressings [illegible] sterilized.

—

A SCUTTLE VENTILATOR

By Fleet Surgeon [illegible]

Since the beginning of the war all ships employed in the [illegible] have been dark and at night in Northern latitudes in the winter [illegible] the eighteen hours out of twenty-four.

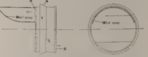
In many of the older men of war [illegible] nearly all the smaller ships [illegible] destroyers [illegible] ventilation on the main hold and they are dependent [illegible] ventilation through scuttles and hatches.

When ships are darkened hatches are [illegible] are closed and fanlights screened [illegible] ventilation is cut off.

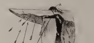
This condition of affairs is [illegible] detrimental to the health of those living in these [illegible] adds much to their discomfort. Any means [illegible] ventilation can be improved should be of importance and [illegible]

large number of Service and merchant seamen more especially to those responsible for their general health

In this ship (the "Blake") various devices have been tried and experimented with to obtain air and at the same time to prevent any light showing. In harbour on main decks, there is no reason why they should not be used though possibly at sea there are reasons why scuttles and deadlights should be kept closed



Scuttle ventilator with wind scoop addition



Scuttle ventilator (...) ... part removed

Of all the devices that I have seen the one I now wish to bring to ... is the simplest and most efficacious. It has been designed and made by Engineer Lieutenant Commander Ronald G Morton and the ... of this ship. It is in use to a limited extent both here and ... the destroyers but owing to the pressure of work it has not been possible to turn out any quantity. Having one in use in my own cabin I can testify to its thorough efficiency and to the fact that it quite prevents any light showing outside the ship. It is in fact more efficient in this respect than a carelessly screwed up deadlight

Description of Ventilator

The ventilator consists of a drum made of tin which is made to accurately fit the porthole. A small inclined flange (A) fitted round the

outside of the fiddle bears against the scuttle flange to prevent any light escaping due to incorrect fit of the drum in the porthole. This flange also prevents the ventilator slipping through.

Each diaphragm has a segment (B) cut away in such a position that it is diametrically opposite to its fellow; the height of the segment should be about one eighth of the diameter of the drum.

For a full sized scuttle the depth of the drum, as at present made, is 6 in. and the depth of the flange is 2 in., the latter being fixed at an angle of about 45 degrees.

The whole ventilator should be painted dull black, and this is important. A small clip can be fitted to scuttle screw to keep ventilator in place, if necessary.

A wind scoop may be fitted to the outside of the drum, but except in hot climates or perhaps in destroyers, this is probably not necessary. Possibly the ordinary wind scoop provided by the Admiralty for ships in hot climates could be adapted for the purpose by the addition of the diaphragm cut in the manner described and fitted with a flange.

In peace time the ventilator would be of use in regulating the air supply in cabins where the scuttle cannot be opened without causing a draught on the person sleeping in the bunk beneath, and would possibly allow ventilation at sea by keeping out spray, which would otherwise necessitate the closing of the scuttle.

The ventilator is simple in design and would be cheap to make, and should be of some use in almost every class of ship. The use of these ventilators also tends to obviate the excessive sweating of the bulkheads which is so prevalent and difficult to prevent.

Reviews.

ANNUAL REPORT OF THE SURGEON GENERAL UNITED STATES NAVY (FOR THE FISCAL YEAR 1914).

This Report, which deals with statistics of health for the calendar year 1913, shows a steady general improvement in the health of the United States Navy in recent years and a remarkable decrease in sickness from typhoid fever, which is alluded to in more detail below.

Diseases of Special Interest.

Malaria.—The incidence of this disease increased from 11.63 per 1,000 in 1912 to 12.07 in 1913. This increase is accounted for by the cases occurring in ships in Mexican waters. The value of screening was well demonstrated, those ships which were well screened escaping the disease or having only a few cases, while unscreened ships under the same conditions had a large number of cases.

Small-pox.—An outbreak in the "Ohio" during December, 1913, shows the protection derived from general vaccination. There were [illegible] cases with 5 deaths in this ship.

The "Ohio" and the "Vermont" visited Marseilles and remained there for about a month, during which time leave was freely granted

Small pox of a virulent type was known to be present in Marseilles. The crew of the "Vermont" had been vaccinated before leaving for European waters; no small pox appeared in that ship, though the men were exposed in the same manner as those of the "Ohio."

There was no record of any vaccination having been done in the "Ohio" for two years before the outbreak, and vaccination of the crew immediately gave 89.57 per cent. of "takes." A draft of 100 recruits was received in the "Ohio" shortly before sailing for Europe, but these men had been freshly vaccinated and no small pox appeared amongst them.

Typhoid Fever.—In view of the fact that anti-typhoid inoculation was made compulsory early in 1912 in the United States Navy for all officers and men under 45 years of age, the remarks of the Surgeon General have particular interest.

The incidence of typhoid fever for the past five years is shown by the following table:—

Year	Admissions: Number	Admissions: Rate per 1000	Died	Sick days
1909	189	3.50	17	10,378
1910	193	1.90	10	9,436
1911	292	5.01	15	11,024
1912	57	1.02	9	5,231
1913	32	0.63	4	1,657

The remarkable decreases in 1912 and 1913 will be noted. It is probable that the full effect of general inoculation would not be apparent until 1913. It is remarked that no one knows how long the immunity produced by the prophylactic will last, but that the advice and work of the United States Navy specialists in connection with those of the Army and Public Health Service, it is hoped, will give this information before the immunity is lost.

Sanitary Conditions and Measures Afloat.

In this section of the report are several interesting observations, particularly in regard to toilet equipment, first aid instruction, and engine room conditions.

The type of toilet equipment (i.e., w.c.) has been found faulty, and it is believed a more satisfactory type could be obtained. Future ships will have toilets adjacent to isolation wards for use only by the occupants of such wards; thus the danger of spreading contagion by close stools, which often have to be carried for a long distance before they can be emptied, will be largely nullified.

First Aid Instruction is given to the personnel of the United States Navy by the division officers. After two years of observation, it is still a question if it would not better to return to the former system of giving first aid instruction by the medical officers and hospital corps men. The Surgeon General recommends that a committee be appointed to consider this subject.

The experiment of closing in the engine room hatches of some ships and providing powerful exhaust blowers at the top of the engine room with powerful supply blowers at the bottom has proved a great success, the engine room conditions in such ships being ideal; the temperature seldom goes above 90° F. in moderate climates and often lower. It is stated

not [illegible] most important [illegible] would be unbearable [illegible]

THE PRACTITI[illegible] by J Keogh M[illegible] Press [illegible]

The value of [illegible] and for [illegible] within a year [illegible] before the [illegible] important disc[illegible] rather [illegible] betical lis[illegible] well known [illegible] and thorough [illegible] information [illegible] brought up to [illegible] and cure [illegible] into constitutions [illegible] agents infections [illegible] the diseases [illegible] various systems [illegible] of children Life insurance clinical pathology, medico legal points and mental disorders follow Surgical conditions and anæsthetics take up the next 300 pages obstetrics and gynæcology another 200 and from those we pass to the diseases of special regions eye ear throat and skin, the last 100 pages being devoted to special forms of treatment

The whole is a very useful work to have handy for those who are in general practice either on shore or afloat It is in clear print on good paper and the illustrations inserted are useful F W B S

AN OPERATING THEATRE IN PRIVATE PRACTICE By G Herbert Whitford M R C S L R C P London Harrison and Sons Pp 76 With illustrated supplement Price 3s 6d net

In this little book the author describes a small operating theatre built in 1911 to his designs at a nursing home In the preface he emphasises the great disadvantages from the view of surgical cleanliness of operating in the bedroom of a nursing home or in the bedroom of a private house His aim was to evolve a building in which strict asepsis could be observed with a minimum of labour for all concerned, appearances being made subservient to utility and ease of working

The opening pages give a general outline as to the floors windows doors water supply, lighting heating, bells and sterilizers The heating of the anæsthetizing room and the theatre is by electricity the heaters being let into the surface of the wall 6 in above the floor level The surface of each heater is enamelled, and is flush with the wall There are four in the theatre and two in the anæsthetizing room one in either wall and each is actuated by a separate switch It is remarked that such electric heaters constitute a great improvement on those worked by water steam or gas and that the cost of running is not excessive

Full descriptions follow of the anæsthetizing room dressing room sterilising room, and theatre, the equipment of each being dealt with Contrary to the opinion held by some surgeons the author finds a temperature in the operating theatre of 60° to 65 F to be amply sufficient always provided the patient lie on a warm table with his limbs warmly clothed and all unnecessary exposure avoided The operating table is also heated by electricity a removable metal box being fixed

[illegible] the [illegible] [illegible] layer [illegible]

[illegible] illustrations of the theatre and sterilizing [illegible] the general equipment during 1913 are given [illegible]

[illegible] durable and interesting devices are described [illegible] inventive genius of the author liable as Naval Medical Officers [illegible] be called upon at short notice to design and equip a small operating [illegible] the book should prove of great interest to them, and can be strongly recommended W L M

The Extra Pharmacopœia Martindale and Westcott Sixteenth edition Revised by W Harrison Martindale, Ph D , F C S , and W Wynn Westcott M B Lond , D P H London H K Lewis, 136 Gower Street W C 1915 Vol I, pp xl + 1,113 price 14s net Vol II pp viii + 469, price 7s net

The popularity of this work is demonstrated by the fact that it has attained its sixteenth edition As in the last edition the book is divided into two volumes The first describes the properties manufacture, administration and uses of those " Extra pharmacopœial " chemicals and drugs which have attracted particular attention in the medical world This volume also deals with vaccines organo therapy and the sale of poisons It contains a list of the most potent antiseptics, based on wide researches, and concludes with a general posological index referring to both volumes and an extended therapeutic index of diseases and symptoms Volume I includes everything any one is likely to require for immediate reference in therapeutic matters whilst the second volume acts as a supplement for further study since many articles which would not necessarily be required on the spur of the moment have been transferred from the former to the latter and thus the comprehensiveness of the first volume has been enhanced by lending it space for current expressions of opinion on the trend of therapeutics

The changes in the new " British Pharmacopœia " of 1914 are marked by the inclusion of twenty new drugs of which adrenalini liquor hydrochloricus, veronal cresol hexamina (urotropine) injectio strychninæ hypodermica liquor formaldehydi methyl salicylas, methylsulphonal, and resorcinum are probably the most important, and the exclusion of fourteen old preparations of which papaveris capsulæ, sarsæ radix, stramonii semina and zinci sulphocarbolas were the most familiar

With regard to patent medicines, as the current war will naturally place Teutonic preparations in disfavour, probably for generations the authors have provided the numbers of aliens patents for which licences have been granted to British manufacturers

The various methods of producing anæsthesia, both local and general, are fully discussed under the headings of the respective drugs employed The article on stovaine is to be particularly commended

The chapter on Organic Arsenic Compounds has been revised, the new dosage and methods of use of arseno benzol being amply expounded

The chapter on Mercury contains much additional information e g the large doses of calomel used in the treatment of dysenteric diarrhœa and the experiments conducted with several entirely new organo mercury compounds

Under Specifics has a full account is given [illegible] dysentery and liver abscess by relatively [illegible] emetine which have also been used with [illegible] hæmoptysis

The reader will find in the chapter on N[illegible] deal of extremely useful information on the various [illegible] milk preparations for the sick, the feeding of [illegible] discussed and references are given to current l[illegible] of boiled versus unboiled milk Refined paraffin [illegible] tion as an intestinal lubricant receives adequate atten[illegible]

In the section on Radiology a new Tungsten [illegible] with and the treatment of ringworm hypertrichosis [illegible] tonsils is well described

The chapter on Radium has been thoroughly revised in the light of the latest research The account of the therapeutic use of the metal is enhanced by many important communications

With regard to vaccine therapy the authors hold that results undoubtedly justify the claims put forward on its behalf and the sections on asthma bronchitis, pulmonary catarrh diphtheria gonorrhœa eczema and rheumatism contain much new matter in support of their contention The article on tuberculin treatment also sheds new light on the subject This work shows too that in the field of organic therapy there has been much activity

The therapeutic index of diseases and symptoms at the end of Volume I constitutes a valuable guide to reference in emergencies There is, no doubt, that both volumes should find a place in every medical man's library R C M

An Index of First Aid By J M Carvell M R C S L S A London John Bale Sons and Danielsson Ltd 1915 Pp 132 12 illustrations Price 1s net

This little work should be of great service to those who are or who are likely to be frequently called upon to render first aid It can be conveniently carried in the coat pocket and in an emergency the required information as to how to deal with a particular injury or illness can be obtained in the shortest possible space of time, as every conceivable point is indexed alphabetically and in many cases with cross references

The author invites suggestions for improvement We think that a larger number of illustrations would be of great assistance to most first aiders R C M

A Textbook of Radiology By Edward Reginald Morton M D C M Trin Tor F R C S Edin &c Past President Section of Electrotherapeutics, Royal Society of Medicine in charge of the X-ray Department West London Hospital &c London Henry Kimpton 1915 Pp 221 With 26 plates and 72 illustrations Price 7s 6d net

The aim of the author of this book is that it should form a useful guide to those taking up Radiology for the first time, and in this he succeeds admirably The chapter on Electrical Principles is written in a clear straightforward fashion—no attempt being made to go too deeply

[illegible] is given to [illegible] production of the [illegible] tension [illegible] coil. The author [illegible] considerable [illegible] study of the X ray tube [illegible] valuable [illegible] radiologist's equipment so [illegible] that a careful [illegible] will well repay the [illegible] description of the [illegible] tube, though at present [illegible] use to the naval [illegible] is interesting as [illegible] lines on which the X ray tube of the future may be [illegible] more efficient. [illegible] interpretation of negatives [illegible] to the few elementary remarks suitable to the scope [illegible] matter—it being well known that only by examining [illegible] plates [illegible] interpretation become [illegible]

[illegible] Regional Radiography will be of great use to the [illegible] he does not know how to obtain the best results in [illegible] the body. Further by establishing and following out [illegible] of working his results become uniform and so [illegible] the normal appearance can be more readily detected. [illegible] Internal Disorders will be useful to those who have a more [illegible] knowledge of the subject. Until he has obtained a complete [illegible] his apparatus and especially of his X ray tube it is [illegible] not to attempt these more difficult investigations. The [illegible] illustrated and the plates are clear and well chosen [illegible] with advantage on the book shelf of every naval [illegible]

A. K. S. S.

Abstracts and Translations.

[illegible] (C. M.). A New Method of Examining Stools for [illegible] States Naval Med. Bull., January, 1915, vol. ix, No. 1.

[illegible] describes a useful method for detecting the ova of [illegible] parasites in the stools of suspected cases. It is very simple [illegible] carefully carried out, effective, since it depends on the [illegible] the ovum itself practically takes no stain, whereas most [illegible] material becomes deeply pigmented.

The following technique is recommended:—

(1) About [illegible] of fæcal matter are thoroughly mixed with 5 c.c. [illegible] solution of lysol (or water only may be used).

[illegible] is centrifuged and the supernatant fluid decanted off, the [illegible] repeated two or three times.

[illegible] of the sediment is placed on a clean slide and a small [illegible] mixed with it. A cover glass is then placed [illegible] examined first with a [illegible] then [illegible] objective.

P. W. B. S.

[illegible] The Application of Wassermann's Reaction to the Solution [illegible] of Tropical Ulceration. United States Naval Med. [illegible] January, 1915, vol. ix, No. 1.

In this [illegible] and instructive paper the author draws [illegible] the great importance of utilizing the Wassermann reaction

for determ[illegible] of the frequent and extensive ulcerations met with in the Tropics. As he states, so frequently there is in these [illegible] that of an underlying disease with a local infection [illegible] to the extensive destruction of the tissues. The [illegible] destructive diseases are leprosy, tuberculosis and [illegible] the Tropics yaws or the twin brother of syphilis. From his own experience and those of others in the Philippines and [illegible] he believes that syphilis is rampant in these areas and is the main cause of most of the severe lesions in leprosy, certain [illegible] ulcus, tropical phagedaena and gangosa. He quotes the [illegible] and others to show that histologically there are no characters in these diseases that can distinguish them from syphilis. For the Wassermann test he has used Noguchi's and [illegible] methods, but prefers the latter. In examination of 200 lepers he obtained 44.5 per cent. positive Wassermann reactions and in 373 [illegible] suspected of syphilis it was 48 per cent. Of tubercular prisoners in the Philippines there was a percentage of 21.6 positives, giving 41 per cent. positive reactions of all the natives examined. In [illegible] all types of syphilis were seen in the living, yet post mortems disclosed very little visceral evidence of syphilis, also that primary chancres are rarely seen. The latter fact is probably due to the habits of the natives who would take no notice of a sore which gave rise to little discomfort, hence the frequency of tertiary manifestations among them. The article of R. H. Major in the *Johns Hopkins Hospital Med. Bull.* is quoted in which he tested 1,200 general cases, 20 per cent. gave positive reactions and of these nearly one-fourth gave no history of a primary sore. In a comparison of whites and natives, the negroes showed twice as many positive reactions as the whites, indicating the greater frequency of syphilis among the coloured races. The author discusses gangosa very fully and he considers that this disease is but a manifestation of syphilis, in contradistinction to the opinion held by many well known tropical authorities, including Ballour. At the end of the paper he summarizes his conclusions thus:—

(1) Syphilis and framboesia constitute a serious problem in public health in the Tropics and are the chief causes of mutilating ulcerations in Guam and the Philippines.

(2) The Wassermann reaction is of incomparable importance in tropical medicine.

(3) Gangosa in Guam and the Philippines comes in the class of complement absorbing diseases, and is on this basis comparable to tabes dorsalis and general paralysis. The illustrations are excellent, and give a very vivid idea of the conditions frequently found.

(It is however important to note that leprosy, framboesia, and most spirochaete infected diseases have long been known to give rise to a positive Wassermann reaction, which is a group reaction. It is therefore rather too sweeping to class all cases where a positive reaction is obtained as syphilis.) P. W. B. S.

McCULLOCH (I. I.), Surgeon U.S. Navy. The Best Training for the Hospital Corps for the Fleet. *The Military Surgeon*, Vol. xxxi. No. 1. January 1915.

The [illegible] Training School for the Hospital Corps of the Navy was established during 1911 at the Naval Training Station, Newport, R.I.

[illegible] and primary object being to [illegible] for a [illegible]. At the Newport Naval Training Station [illegible] to be [illegible] all the vocational schools of the Navy [illegible] the spirit of [illegible] and friendly rivalry which would [illegible] elsewhere.

The completion of a new naval hospital at Newport left the old hospital available for the Training School for the Hospital Corps. The [illegible] were readily converted into laboratories and [illegible] rooms to [illegible] for a class of 100 students or twice that number by dividing the class into two groups. The recruit is housed in quarters which closely approximate those aboard ship as long as he remains at the station.

The school has all necessary equipment for teaching the subjects its curriculum includes, which are as follows: Anatomy and Physiology, First Aid and Emergency Surgery, Hygiene and Sanitation, Clerical Duties, Pharmacy, Chemistry, Materia Medica and the Action of Drugs, Toxicology, Foods and Cooking, Litter and Stretcher Drill, Tent Erection (including the field hospital camps and compliance with expeditionary forces, embalming and disposition of the dead).

The course comprises six months. Two subjects to which particular attention is given, are practical pharmacy and materia medica, as neither hospitals nor battleships are adequately equipped for the instruction in these subjects to be continued.

For each twenty five students, one hospital steward is required as demonstrator, and a pharmacist gives the morning instruction in pharmacy, chemistry and clerical work. One medical officer's entire time is required for lecturing and administrative purposes.

When service conditions permit, the graduates are first transferred to hospitals for duty, where they receive further instruction and acquire further experience in practical nursing, the operating room, and all hospital duties. It is not contemplated that instruction should cease on graduation from the school, but will continue until the apprentice has reached the grade of hospital steward; this grade can be reached in the minimum time of three years. It is believed that the Training School for the Hospital Corps of the Navy, together with that instruction given by medical officers and senior members of the hospital corps at naval hospitals and in ships, will provide the best training, and that this Corps for many years noted for its efficiency will maintain its high place among the naval services of the world. W. L. M.

[illegible] (N. J.), Medical Inspector U.S. Navy. The Advisability and Practicability of Specialists in the Medical Corps of the Navy. *[illegible] Military Surgeon*, vol. xxxvi, No. 2, February, 1915.

The author is decidedly adverse to the appointment of specialists [illegible] the officers of the Medical Corps in general, but he believes that all hospitals and hospital ships should have the services of specialists [illegible] specialists being members of the Medical Reserve Corps; that each hospital should have a bacteriologist and a trained röntgenologist just [illegible] hospitals have. These men should be trained in their specialties [illegible] paid accordingly, but should not be in the Medical Corps or required [illegible] other duties.

It [illegible] the author's opinion, gained after an experience of twenty [illegible] in the Navy, serving through all the grades and duties from

[illegible] or assistant in command of a hospital, then the naval medical officer is a specialist in the highest sense of the word [illegible] too much already expected of [illegible] to do his specialty and then to introduce into the specialty other specialties each in itself a life work and study is undesirable and absolutely impracticable in the [illegible] of an efficient and homogeneous corps. W. J. M.

FRANCIS (EDW.) Surgeon U. S. Public Health Service. A Practical Method of Embalming on Shipboard. *The Military Surgeon*, vol. xxxvi, No. 2, February, 1915.

The great importance of ensuring a uniform distribution of the proper fluid in the correct amounts throughout the body is emphasized. In order to get a uniform distribution of fluid it is usually necessary to make six injections, i. e., into each brachial artery toward the extremities, into each femoral artery toward the extremities, into one common carotid toward the head and into the same carotid toward the heart. In each instance when injecting the brachial, femoral or carotid arteries [illegible] the fluid is immediately seen returning through the veins and [illegible] the operator can rest assured that the fluid bathes all the tissues of the extremities or head.

The technique of injection is a matter of the greatest importance. A single injection into but one artery does not produce the widest possible distribution of the fluid, though the author does not deny that in temperate climates bodies are injected constantly through a single incision with a small amount of fluid and are preserved for two or three days [illegible]. If, however, a body is to withstand the high temperature of the tropics, its definite preservation will depend on its complete sterilization.

[illegible] the [illegible] at the Hygienic Laboratory of the Public Health Service has proved effective in preserving human subjects exposed [illegible] to a temperature of [illegible]. The formula of this fluid is as follows:

[illegible] (40 per cent formaldehyde)	[illegible] c. c.
[illegible] ($Na_2B_4O_7$)	[illegible]
Water sufficient to make	1000 c. c.

[illegible] strength of this formaldehyde, 40 per cent [illegible] [illegible] formula of [illegible]

An objection to formalin is that it bleaches muscle [illegible] to an ashy gray. This is overcome by adding an alkali to the formaldehyde solution, thus changing its reaction from acid to alkaline. The common alkalies [illegible] deterioration of the formaldehyde. Borax furnishes the desired alkalinity with only the slightest deterioration of the formaldehyde [illegible] and [illegible] is the additional advantage of [illegible] itself a preservative.

The injection apparatus consists of a [illegible]-gallon bottle through the rubber stopper of which pass two glass tubes: one tube extends to the bottom of the bottle and affords an outlet to the fluid, which is carried by a rubber tube to the glass cannula; the other tube is connected by rubber tubing to a pump—a bicycle foot pump is very effective.

[illegible] objects [illegible]

[illegible]

It is not [illegible] to the [illegible] be [illegible] in the [illegible] cation and [illegible] skull. The mouth [illegible] plugged [illegible] soaked in the fluid [illegible] with the fluid. [illegible] rubbed liberally [illegible] bandaging, will [illegible] drying.

It will be found [illegible] proportioned [illegible] often be [illegible] stances [illegible] lips or side of the [illegible] injection should [illegible] sometimes [illegible] perhaps to [illegible] with practice on [illegible] joints and to stop [illegible] injection of an extra [illegible] the fluid has [illegible] well from the arteries [illegible] capillaries and back into the veins.

W. L. M.

PUBLICATIONS OF SMOKE INVESTIGATIONS. *Bulletin* ix, 1914, pp. [illegible] Mellon Institute of Industrial Research and School of Specific Industries, University of Pittsburg, Pa., U. S. A.

The Influence of Smoke on Health. The University of Pittsburg (U. S. A.) has been enabled by the generosity of Mr. R. B. Mellon to carry out an investigation into the smoke problem, and the Mellon Institute of Industrial Research and School of Specific Industries has brought out nine bulletins dealing with various aspects, such as the [illegible] and the meteorological, of this subject. The [illegible] bulletin (1914), edited by Professor Oscar Klotz and Dr. W. [illegible] [illegible] devoted to the influence of smoke on health and consists of [illegible] of the literature on the subject by Dr. Cohoe and of a number of papers. Although it has been popularly thought that smoke does not act [illegible] on health, practically all serious workers agree that it [illegible] [illegible] increasing the severity and mortality of acute diseases of the respiratory tract, [illegible] part due to lowering of the [illegible] resistance. [illegible] statistical tables show that a most striking feature of [illegible] is the [illegible] of the mortality rate from acute respiratory diseases [illegible] with industrial activity and the consequent irritation by smoke of the respiratory tract. In Pittsburg there is an extremely acute and [illegible] form of pneumonia, the distribution of which in the wards of that city corresponds in a remarkable manner with the smoke content. Further, there is a noticeable similarity between the total pneumonia [illegible] and the total number of smoky days, and it is possible that pneumococcic invasion is facilitated by irritation of the mucous surfaces by foreign substances (White). The deposit of carbonaceous material on the lung tissue (anthracosis), which

[illegible] cytes leads to [illegible] have lymph [illegible] solution of [illegible] lung. On the [illegible] to pulmonary [illegible] has been [illegible] appears to be that smoke has any [illegible] one. [illegible] in which the [illegible] is either [illegible] or is active [illegible] additional [illegible] to fibrosis and [illegible] the local[isation] of the tubercular [illegible] spaces (Haythorn). [illegible] con [illegible] of soot, in which he shows that soot [illegible] due either to absorption of moisture [illegible] probably to the action of its contained [illegible] on the other hand soot as it occurs [illegible] a transparent covering for streets and [illegible] from the destructive action of sunlight [illegible] of anthracosis Klotz points [illegible] the carbon is fairly uniform in the [illegible] is considerable variation in the [illegible] the interlobar and diaphragmatic [illegible] and the grooves produced by the ribs [illegible] anthracosis alone does not appear [illegible] adhesions.

H. D. R.

Mosse[illegible] of Aplastic Anæmia, *Irch. Int. M.* [illegible]

Aplastic [illegible] regarded as a form of pernicious anæmia in which [illegible] respond to the call made upon it to regenerate [illegible] of hyperplastic. As a result the disease [illegible] any evidence of regeneration of the red blood [illegible] absolute decrease in the number of the granular [illegible] manufactured in the bone-marrow. In this paper [illegible] summary of the subject and argues in detail against [illegible] special form of pernicious anæmia. He has analysed [illegible] of them including a necropsy which has usually [illegible] to this diagnosis though he believes that the [illegible] of the blood and symptoms are so typical that [illegible] with certainty during life. The disease is essentially [illegible] adult life, and is rather more frequent in males. The [illegible] rarely more than a few weeks to one or two months, and [illegible] has been noted in one case only. An especially characteristic [illegible] is the tendency to subcutaneous or mucous hæmorrhages. [illegible] and may be higher than in other forms of anæmia. [illegible] anæmia, with a low rather than a high colour index [illegible] stippling, poikilocytosis, anisocytosis and nucleated [illegible] cells are absent. Leucopenia is pronounced as is well seen in the [illegible] produced by benzol poisoning. There is an [illegible] in the granular leucocytes (8 to 20 per cent of all forms) and [illegible] increase of the lymphocytes. There is complete and total [illegible] of the red marrow, so that its place is taken by fat in which [illegible] cells are discoverable.

Against the generally accepted view that aplastic anæmia is pernicious

[illegible] to which th[illegible] evidence of th[illegible] part of [illegible] as is shown [illegible] of [illegible] attached [illegible] to hyp[illegible] such as [illegible] jection of [illegible] serum. Hæm[illegible] permeab[illegible] reports [illegible] the aplast[illegible] due solely to changes in th[illegible] the resistance of the red [illegible] or pernicious anæmia [illegible] the chief [illegible] which is the total lack of [illegible] at th[illegible] corpuscle or formation [illegible] and other morbid changes [illegible] experimental hæmolytic anæmia [illegible] the [illegible] may be the selective [illegible] (hæmolytic toxin) [illegible] According to [illegible] corpuscle [illegible] and therefore of all the [illegible] was at once [illegible] paralysed at once [illegible] aplas[illegible] course of the [illegible] would be a few days only but some [illegible] must be resistant or less vigorously acted on by the toxin. — H. D. R.

[illegible] — Recent Studies in the Pathology of Thrombo-angeitis Obliterans. [illegible] Research [illegible] and Surgery [illegible] 1914 November.

Th[illegible] thrombo-angeitis obliterans [illegible] emigrants and th[illegible] emigrants from Poland [illegible]. During the last eight years [illegible] has seen 200 cases [illegible] and Leo Buerger [illegible] Weber has described cases under the title [illegible] from the East End of London and is inclined to [illegible] cigarette smoking. The clinical manifestations are [illegible] intermittent claudication or [illegible] the [illegible] of the leg, cold [illegible] pallor of the leg when elevated [illegible] toes and gangrene of the extremities. Then [illegible] of Raynaud's disease. [illegible] the obliterans [illegible] Buerger who found that the [illegible] of the leg are occluded [illegible] extensive thrombosis [illegible] [illegible] the [illegible] pathological [illegible] [illegible] of the [illegible] but its [illegible] from migrating [illegible] the deep [illegible] [illegible] extending to [illegible] with [illegible] in the part of the [illegible] Migrating thrombus [illegible] occur in the patient [illegible] which occur to [illegible] do not contain tubercle bacilli [illegible]

[illegible] endotheloid cells [illegible] times [illegible] should form blood [illegible] to [illegible] fibrous and [illegible] occur [illegible] of the vessel. The [illegible] patches of [illegible] phlebitis [illegible] also forms [illegible] and as it [illegible] cellular [illegible] features. [illegible] suggests [illegible] this has not [illegible] papers are illustrated [illegible] photomicrographs.

H. B. R.

GORIS (J. H. W.) [illegible] Vitality of the Cholera Vibrio outside the Human Body. [illegible] 1914 vol [illegible] No. 4.

In [illegible] found that the cholera vibrios [illegible] for six to eight days during the colder months of December [illegible] February, but that in the hot months, April to August, [illegible] was greatly reduced. All the [illegible] during the investigation pointed to the danger of spreading the disease by means of [illegible] and not, as is usually held, by water infection.

Goris recommends as a prophylactic measure in times of epidemics that water should be made feebly acid. This causes the death of the vibrios. Ten grammes of vinegar to a litre of water (1 per cent.) will sterilize it in ten minutes.

P. W. B. S.

VIALLI (H.) Sur la Pathogenie du Choléra. *Comp. Rend. Acad. Scien.* [illegible] 1914 [illegible] No. 23.

By experiments on rabbits and dogs the author showed that the absence of bile plays an important part in the production of cholera. He found that a virulent cholera culture introduced directly into the intestine did not cause cholera; that an increase or decrease of the pancreatic secretion had no effects in causing the disease; but that obstruction of the common bile duct and injection of a cholera culture into the intestine below the pancreatic duct caused a typical attack. He also found that when cholera toxin was injected intravenously the secretion of the bile was diminished, and if after such an injection a cholera culture was introduced directly into the intestine below the pancreatic duct cholera was produced. He concludes from these that a proper secretion of bile is the chief protection against cholera.

P. W. B. S.

[illegible]

DESMETS [illegible] and Cholera. [illegible] 1914 [illegible] No. 2.

The author describes his experience of the action of adrenalin in an epidemic of cholera. He treated 166 cases with 2 mg. intravenously or 3 to 5 mg. subcutaneously. In these there were only forty six deaths, or a mortality of 26 per cent. In a control series of 110 cases treated by ordinary routine methods [illegible] per cent. died. It is noted that in neither series of cases were hypertonic injections or anti-cholera sera used.

P. W. B.-S.

[illegible] Cholera Inoculation in Greece, [illegible], 1913, vol. xxvii, No 30.

[illegible] the Greco Turkish War no cases of cholera occurred in the [illegible] Army but in the Greco Bulgarian campaign cholera was very [illegible]. About 500,000 people were vaccinated in Greece in accordance with the method of Kolle. The incidence among the uninoculated was 93 per 1,000 and amongst those inoculated once 42 per 1,000 and amongst those inoculated twice it fell to 27 per 1,000. The case mortality also showed a great reduction in the inoculated, for the unvaccinated it was 77.5 per cent, for those once vaccinated 12.2 per cent and those twice vaccinated 10.2 per cent. P. W. B. S.

News of the Service

THE NAVAL MEDICAL SUPPLEMENTAL FUND

In our [illegible] issue [illegible] account of the history and objects of that Fund was [illegible]. It was [illegible] the repeal of the original Act of Parliament governing the Fund was [illegible] the [illegible] work of transferring its administration [illegible].

Medical Officers will be interested to learn that the Act has now been repealed by [illegible] and [illegible] Management [illegible] Rules will be [illegible] [illegible] April. [illegible] Order in Council will place the Fund [illegible].

[illegible] Rules [illegible] proposed which should greatly [illegible] the [illegible] Fund [illegible] that the subscription [illegible] and that the [illegible] [illegible] completed [illegible].

PROMOTIONS

Ralph [illegible], M.B., F.R.C.S., Surgeon R.N.V.R., promoted to Staff Surgeon R.N.V.R., December 21, 1911.

Edward J. [illegible], M.B., Surgeon R.N.V.R., promoted to Staff Surgeon R.N.V.R., February [illegible], 1912.

Harry R. [illegible], M.B., Surgeon R.N.V.R., promoted to Staff Surgeon R.N.V.R., March [illegible], 1912.

William [illegible], M.D., Surgeon R.N.V.R., promoted to Staff Surgeon R.N.V.R., August [illegible], 1913.

Robert [illegible], M.B., F.R.C.S., Surgeon R.N.V.R., promoted to Staff Surgeon R.N.V.R., March [illegible], 1913. [illegible] special promotion for conspicuous [illegible].

[illegible], M.B., Surgeon R.N.V.R., promoted to the rank of [illegible] Surgeon, March [illegible], 1914.

APPOINTMENTS

[illegible]

[illegible] Surgeon [illegible] R. H. Jones to the hospital ship Maine. H. C. [illegible] to the Naval [illegible].

Staff Surgeon [illegible] W. B. Smith to the [illegible]. A. [illegible], M.B. [illegible] [illegible] additional for disposal. T. A. Smyth to the Victory additional for disposal. R. Kennedy [illegible] T. S. Wilkinson to the Vivid additional for disposal. A. Davidson, M.B. [illegible] Naval Base. W. R. Harrison to the Inconstant. T. A. Smith to the [illegible] additional for [illegible] Sick Quarters.

Depot, Deal, J Bradley to Portsmouth Dockyard, A S G Bell to the Laurentic, M J Smith M D, F R C S to the Victory addl for disposal J P Hall M B to the Vivid addl for disposal, E D J O'Malley to the Pembroke addl for disposal, E C Sawdy to the Vivid addl R Huskins R N (Retired) to R N Division Blandford, E D J O Malley to the Victory addl for disposal; W W Keir M B to the Warspite; R W Stansfield to the Pembroke addl for disposal.

Staff Surgeons B R Bickford to the Pembroke addl; [illegible] K Beale to Bathurst W T Stallard G H S Mills, M B (Emergency List), to Chatham Dockyard T H McDowell to the Indus, T F Blunt to the Ophir; N B V Jacob to Eastchurch Air Station; N B V Jacob to Foreign Air Craft Base H N Wells to Eastchurch Air Station J G Waller to the Victory addl for disposal H L Geoghegan M B, B A to the Victory addl for disposal R Hughes to the Pembroke addl for disposal B R Harley to the Royal Arthur; E H St B E Hughes to the Sentinel.

Surgeons C D Macintosh to the Victory addl for disposal M P Fitzgerald M B to the Victory addl for disposal B E P Severs to the Victory, addl for disposal; F W Quirk to the Vivid, addl for disposal H R B Hull to the Benbow; Chase G L D Ellis to the Warspite B E P Seyers to the Princess Margaret W A S Duck to the Ramnis A Fairley to the Orion T C Patterson M B to the Vivid addl for disposal

Staff Surgeons R N V R W Allen to the Vivid addl for disposal; A R Fairley M B F R C S to Haslar Hospital

Surgeons R N V R W H Bleaden to the Pembroke addl, T Turner, M P, to be Surgeon and Appt at Eastbourne T J Steggmun to the Pembroke, addl for disposal T D McEwen M B to the Pembroke addl for disposal

Temporary Surgeons A C Murray M F to Royal Marines Deal G M Oakden to the Prince George D R Pollit Seulght M B to Haslar Hospital G S Aspinall to Haslar Hospital W B Cunningham M B to Chatham Hospital; W J Clegg M B to Chatham Hospital A E Stewart M B to the Vivid addl for disposal D S MacKnight to the Vivid addl for disposal C E Bunking to Wormwood Scrubbs R N Air Station E Hefferon M B to Wormwood Scrubbs R N Air Station J A Condon M R to Wormwood Scrubbs R N Air Station J R Thompson to the Sentinel; I F French to the Britannia A E Hunt M B F R C S to Haslar Hospital [illegible] Margetts to the Victory addl for disposal A McMillan to the Egmont W E [illegible] to the Laurentic H Wilk to the Pembroke addl for disposal W [illegible] to Wormwood Scrubbs R N Air Station A R Upton to Chatham Hospital J [illegible] to the Victory addl for disposal J N McR Ross M D to the Pembroke addl for disposal F Braten to the Swiftsure F H Rees to Plymouth Hospital S Worth [illegible] to Haslar Hospital H [illegible] Moss to Haslar Hospital T [illegible] to hospital [illegible] W K Chalmers M B to the Argonaut [illegible] to hospital ship [illegible] R W [illegible] F R C S to hospital ship [illegible] A C [illegible] M B to the [illegible] E J [illegible] J F McCandlish to the Ophir B Black [illegible] [illegible] to the Pembroke addl [illegible] to hospital ship [illegible] to the Vivid addl for disposal W Bell M B to the Vivid addl for [illegible] F A Williamson to the Warspite R S [illegible] M B to the Zealandia [illegible] to Devonport Dockyard [illegible] M B F R C S to hospital [illegible] to the Dartmouth B Maitland to the Vivid [illegible] W [illegible] C [illegible] R N [illegible] Crystal Palace J S [illegible] R N [illegible] F [illegible] Cox to R N Division Deal

Surgeon Probationers R N V R [illegible] to the [illegible] Mitchell to the [illegible] Mitchell to the [illegible] to the St [illegible] Buckingham to the [illegible] Andrews to the [illegible] to the Mongolia

OBITUARY

Since the last number of this Journal was printed the Naval Medical Service has lost six medical officers. These have been killed in action [illegible] and [illegible] with [illegible] "Clan McNaughton" [illegible] work again the Atlantic during an exceptionally heavy gale.

The war from its commencement has exacted a great sacrifice from the Service altogether twenty [illegible] medical officers have been lost, and we are proud [illegible] [illegible] outstanding work performed by them.

Killed in Action

Fleet Surgeon Cecil Taylor, B.A., M.B., was the Senior Medical Officer of the "Formidable" when she was sunk in the Channel by a German submarine on January 1, 1915, and he went down with his ship.

He was educated at Dublin University, taking his B.A. in 1895 and his M.B., B.Ch., B.A.O. in 1897. After holding the post of Resident Medical Officer of the City of Dublin Hospital, he joined the Navy in November, 1897, and served in the Mediterranean, Home Fleet (three times), Channel Squadron, Atlantic Fleet, and the Surveying Service in the Pacific. He was appointed to the "Formidable" in October, 1913.

Surgeon William Mearns, M.B., was lost in the "Formidable" when she was sunk by a German submarine on January 1, 1915. He was a graduate of Aberdeen University (M.B., Ch.B., April, 1908) and entered the Navy in November, 1908. After serving in Home Waters for nearly two years he was appointed to the "Redbreast" in the East Indies. Subsequently he commissioned the "Teal," a China river gunboat. He joined the "Formidable" a few days before war was declared. He represented his University at Rugby Football for the last two years of his student's career. He was a good swimmer and an all round athlete.

Surgeon Septimus Hibbert, R.N.V.R., was lost in the "Formidable" when she was sunk by a German submarine on January 1, 1915. He was educated at University College, Oxford, and St. George's Hospital, and graduated M.A., M.B., B.Ch. in 1913. He joined the Royal Naval Volunteer Reserve on August 14, 1912, but was not called up until the outbreak of war, when he was appointed to the "Formidable." He held the posts of House Physician, House Surgeon, and General Assistant at St. George's Hospital. He was a good athlete and musician, and won the rush at many athletic meetings of his University, and the Sussex County Amateur Championship.

Lost at Sea

Surgeon Vernon Lichfield Matthews was in medical charge of H.M.S. "Viknor"—an armed merchantman—when she was lost with all hands in January. He was educated at the London Hospital and obtained his M.R.C.S., L.R.C.P., in 1906. After holding the appointments of House Surgeon and Aural House Surgeon at the London Hospital, he became Clinical Assistant in the medical out-patient department at the Hospital for Sick Children, Great Ormond Street. He entered the Navy in May, 1912, obtaining the first place in his "batch" and winning the Gold Medal and Pocket Case. His first appointment was to the "Drake," Flagship in Australia, and after paying her off he went to Eastney Barracks. He joined the "Viknor" in November, 1914. He was a good cricketer and played for the Navy against Hobart in 1912.

Staff Surgeon Walter Graham Moore Anderson, M.B., B.Ch., B.A.O., was in medical charge of H.M.S. "Clan McNaughton"—an armed merchantman—when she was lost with all hands in January. He was educated at Trinity College, Dublin, and taking his degree in 1903 filled the post of House Surgeon at the Adelaide Hospital, Dublin. In 1903 he entered the Navy. He was a very good all round athlete, and while serving in the "Impregnable" training ship did a great deal in working up the boys' enthusiasm for manly games and sports. During his three years in the "Scylla," he was present at no less than three revolutions at Haiti, Nicaragua and Honduras, and he was complimented on the wonderfully good health enjoyed by the ship's company of the "Scylla" in a very trying climate. Only last July Staff Surgeon Moore Anderson, at 37 years of age, gained the silver cup presented to the winner of the Officers' Flat Race in the Queenstown Training Service. He was very musical, and his sketches were charming. A more gifted and popular officer it would be hard to find.

Surgeon Probationer Raymond O'Connell Redmond, R.N.V.R., was also serving on board H.M.S. "Clan McNaughton" when she was lost with all hands in January. This promising young officer—a descendant of Daniel O'Connell, "The Liberator"—was only 21 years of age. He was educated at the Royal College of Surgeons of Ireland and the Richmond Hospital, passing his third professional examination in March, 1914. He gained first-class honours in Anatomy. He was a good cricketer and hockey player.

Notices.

The Editors invite Medical Officers to send in Original Papers on professional subjects, travel, personal experiences, &c. Items of news and matters of interest to the Naval Medical Service will be welcomed from ships and establishments on home and foreign stations.

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Journal of the Royal Naval Medical Service.

Original Articles.

REPORT ON THE WOUNDED IN THE ACTION BETWEEN THE "SYDNEY" AND THE "EMDEN."

By Surgeon LEONARD DARBY, M.B., R.A.N.
Senior Medical Officer, H.M.A.S. "Sydney."

At 7.30 a.m., on November 9, 1914, I heard a rumour that a strange warship was at the entrance to Cocos Islands, fifty miles distant. Soon this was confirmed, and though we had had many false alarms previously, instructions were given to get everything below and prepare for action.

The stations for the surgical party, the stretcher bearers with their stretchers, are the fore and aft ammunition lobbies. Two theatres, one for each surgeon and his assistants, are prepared in well separated stokers' bathrooms, which are situated off the tunnel running up the centre of the ship. These bathrooms are 12 ft. by 8 ft. by 7 ft. in size and supplied with hot and cold water; also they contain lockers in which dressings can be stowed. Though not quite below the water line they are well protected above by two decks and on the sides by armour and coal bunkers. One of these bathrooms was appropriated and it was permanently rigged up as a theatre with the operating table, instruments, and dressings stored there ready for immediate use. Unfortunately only two days before the action everything had been taken up to the sick bay, and the room had been painted out with the intention of returning to it on this very day, when the paint was dry. Before the action began at 9.30 a.m. there was only time to get the

equipment down without proper stowing and it was not placed so conveniently to hand as would have happened at any other time. The No. 2 action theatre is not kept ready equipped, but is rapidly fitted up when required with the sick bay mess table as an operating table and stores are taken along the tube from No. 1 theatre. Adjacent to these stations are six more bathrooms, which are cleaned up as well as possible under the circumstances, and they are very useful as shelter places for the wounded as they are brought below.

In addition to the water supply in the bathrooms there was an emergency supply in the captain's and wardroom galley, further aft, along the tube. This was fortunate, because when our guns had been firing for ten minutes the water came through the bath-room taps black, muddy, and useless.

On sighting smoke at 9 a.m. I went round the guns and control stations to see if the first-aid bags were correct; thence to the sick bay to ascertain if anything useful had been left behind; but before I could get below to my station our guns opened fire. The "Emden" soon hit us, and within five to ten minutes from the commencement of the action the first wounded man was brought below to me by the unengaged gun's crew, the stretcher parties having instructions not to go on deck during the action unless directly ordered. The first man had a fracture of the right leg and thirteen shell wounds. He was in great pain and I gave morphia, ordering the sick berth steward to attend to the wounds and put on a splint rapidly because now a constant stream of wounded men came down who required urgent attention. The second case was shot through the chest, and was bleeding freely, with the apex of the heart beating through a hole in the chest wall, a loud inrush of air through the wounds and marked air hunger. Pads and tight bandages were rapidly applied to the wounds, a large dose of morphia being given. Before this case was attended to another was brought down who had various shell wounds of the right leg, thigh and buttock, with perforation of the right eye and two others who were very badly wounded. One of these men had been shot through the abdomen in the left hypogastric area, the fragment emerging in right lumbar region leaving 8 in. of omentum hanging out of the wound; moreover this patient was burnt from head to foot. The other was shot through the base of the heart and soon died. I rapidly administered large doses of morphia and applied first dressings. In the meantime two more men had been carried down and all available

space near my station was taken [illegible] of the stretcher party to give first [illegible] wounded—who were temporarily [illegible] and to place them on beds and blankets [illegible].

One of the last wounded to arrive had [illegible] injured in both feet the left foot being almost [illegible] had a large gaping, flesh wound in the right thigh [illegible] of the face hands and forearms. Whilst attending to [illegible] I received a message from the Captain to [illegible] on the upper bridge and gave orders to the [illegible] party to bring him down to the theatre. [illegible] wounded, with the exception of one who died within [illegible] down had been removed to the wardroom [illegible] in the deck. The wardroom was only [illegible] but space had to be cleared near the [illegible] only available place. By now the [illegible] and fortunately no damage was done to this part of the ship.

Another case wounded in the left thigh and the right arm was soon dressed and taken to the wardroom. We were now clear round our station and I went aft to see the wounded in the wardroom on my way passing Surgeon Todd's station. He had all this time been equally busy and had been handicapped by the fact that on four occasions his sick berth attendant had fainted.

After visiting the wardroom I returned to No. 1 theatre and found that the stretcher party had returned from the upper bridge with the above mentioned wounded man. It had been a difficult place to get at but with the aid of a Neil Robertson stretcher no great loss of time had been incurred. This stretcher, by the way, was most useful and well adapted to a ship of this class with steep ladders, small hatchways and narrow passages. The wounded man had sustained a severe injury to his left leg which had been shot away at its junction with the trunk. He had lost a large quantity of blood and was almost dead on arrival below. I sent for Surgeon Todd, rapidly cut away the patient's clothes and placed him on the operating table. We then administered one pint of normal saline and began to attend to the stump which consisted of a ragged end of skin muscles nerves and vessels longer anteriorly than posteriorly; in fact there was not enough flap left to cover the stump. After a few incisions had been made to pare off the ragged ends the patient died. Some time had elapsed since he had been wounded and haemorrhage had stopped when he arrived below but it was hopeless from the outset, and he must

have lo[illegible] ... [illegible] period [illegible] him

[illegible] excepting two slight cases, [illegible] with [illegible] forearm and another with a slight w[illegible] attended to some hours later

[illegible], after we had been working [illegible] atmosphere at a temperature of [illegible]

The wardroom now contained eleven cases, most of whom were restless and in pain. The initial [illegible] of morphia, in no case less than $\frac{1}{2}$ gr., had been of only slight value, and there was reason to suppose that the solution in the phials supplied had deteriorated. Fresh doses of morphia were administered, and iced water, soda water and brandy to the various cases as thought fit.

At first hydrogen perchloride solution was used for wet dressings and cleansing, mainly because it was the most convenient. The picric acid dressings in the first-aid packages were found most useful for the cases of burns.

During the action the space below was very congested, the tunnel being full of men belonging to the ammunition and fire parties. At the best of times there is little room here, so the regular transport of wounded men was considerably impeded. All the time we knew not how the fight was going—we could only hear orders for ammunition and the continual rapid fire of our guns. At one time, when we heeled over and the operating table took charge, it seemed as though the ship had been badly hit, but we soon found out that this was only due to a sudden alteration of [illegible].

Our constant attention was now taken up by two very severely wounded men. Normal saline was administered in the first case subcutaneously and in the second into the median basilic vein. Their wounds were redressed and all methods of reducing shock were tried. One of these men died after enduring much pain two hours after being wounded. The other improved somewhat after the saline, but air hunger was pronounced, and he complained of constriction round the chest. There was oozing of blood from his wounds and his pulse was very weak.

The remainder of the cases were not so urgent, but many were in considerable pain, and all that could be done was to re-dress until operative interference could be carried out. The wardroom was rapidly equipped as a hospital, lotions, dressings, &c., being placed therein, and the first-aid party did excellent work in looking after

the wants of the wounded [illegible] could not be definitely made out until [illegible] table. As soon as the sick berth staff could [illegible] that the sick bay was to be prepared [illegible] with all dispatch. On account of the state [illegible] and of the sick bay, which was flooded [illegible] this entailed a large amount of [illegible] was unavoidable owing to lack of [illegible] one had to work, so it took some time [illegible] and stores and have everything convenient [illegible] in the sick bay. Moreover there were [illegible] due to requirements of the case [illegible] and evening German sailors were being [illegible] some of them in a very collapsed state [illegible] in the shark infested sea for nine hours [illegible] after some trouble and next day was none the worse [illegible]

It was found to be impossible to [illegible] until the following day (November 10) [illegible] was it considered advisable on account of the [illegible] wounded. The sick bay staff also was too exhausted [illegible] ready with instruments and dressings [illegible] and neither medical officer was in a fit state to [illegible] adequate rest. Until midnight we were [illegible] to the wants of the patients, doing dressings [illegible] injections, passing catheters, &c. The two sick berth [illegible] were sent to bed at 10 p.m., thoroughly worn out [illegible] Todd and myself took four hourly watches from midnight, the first aid party and volunteer nurses having been told off in [illegible] watches to do the nursing.

Early next morning (November 10) we arrived at Cocos Island Cable Station and having [illegible] the damage done here we took off the Eastern Extension Telegraph Company's surgeon (Dr H. S. Ollerhead) to help us with the German wounded. We then steamed back to North Keeling Island to the *Emden*.

We now had the sick bay rigged up as a theatre, having unshipped the beds and made more room. Our chief difficulties were lack of space and trained assistants and we had used up all the sterile towels on the day of the action; also there was much delay in getting instruments re-sterilized. The shortage of trained theatre staff with lack of conveniences caused delays in the preparation of the theatre between each case and the actual operations were delayed because one could not get what was required in [illegible]

[illegible] a theatre staff from volun[illegible] [illegible] basins, handed stores and [illegible] useful work with a composure [illegible] present at many bloody opera[illegible] previously had been in any way [illegible]

Surgeon [illegible] and Dr Ollerhead assisted [illegible] with the [illegible] The first case taken was one of thoracic wound [illegible] and oozing of blood it was [illegible] that there [illegible] in the pleural cavity his colour being bad and als[illegible] Chloroform was administered Examination show[illegible] small fragment had entered the chest in the right axilla [illegible] downwards and forwards to the left through the pleural [illegible] finally emerging just below the apex of the heart [illegible] after the injury the apex of the heart could be seen [illegible] with each thrust A piece of the sixth rib had been [illegible] The wound was enlarged a piece of the rib removed [illegible] made for bleeding points This search could not [illegible] to the patient's condition, so after removal of [illegible] the pleural cavity and then plugging the cavity with [illegible] amount of gauze, we applied a tight [illegible] the wounds and the patient was removed to the only [illegible] bay Saline was given subcutaneously and patient [illegible] considerably for a time, but later on hæmorrhage [illegible] patient died two hours after operation

The next case was [illegible] less serious consisting of numerous wounds in both [illegible] The left leg had been traversed by a fragment which [illegible] lacerated wound through the calf just below the knee joint There was a large entrance wound in the right calf charred at the [illegible] the fragment being deep in the muscles There was anoth[illegible] deep wound in the right thigh on the inner surface and [illegible] smaller wounds on buttocks and back There had been considerable hæmorrhage, but this was controlled by plugging A search was made for fragments, but none could be felt with [illegible] probe and it was decided not to cut down and look for them because more harm than good would have been done The wounds were therefore thoroughly cleansed syringed out with hydrogen peroxide, and plugged with iodoform gauze With careful dressing they remained clean, and patient was doing well when he left the ship There was a good deal of destruction of muscles and nerve tissue but the main vessels

and nerves had presumably not been damaged. An X-ray photograph taken at the hospital at Colombo showed numerous pieces, none very large, of shell in the right leg; but it was there decided that it would be unwise to try and remove them then.

By this time (November 11) we had returned to the "Emden," which was flying distress signals. Arrangements now had to be made for the transhipping and reception of about eighty German wounded (the figures are the estimate of the surviving German surgeon). All available stretchers, hammocks, and cots were sent to the "Emden" with a party under Dr Ollerhead, who did not return till the last patient left the ship some four hours later. Even then some men who had got ashore could not be brought off till next day (November 12).

The transhipping was an exceedingly difficult undertaking, as there was a huge surf running on the beach where the "Emden" was ashore; therefore the collecting and lowering of the wounded into the boat was necessarily painful. They were taken on board the "Sydney" in the cots and stretchers by means of davits, but there was no davit available in the "Emden." One German surgeon was uninjured, but he had been unable to do much, having had twenty-four hours with so many wounded on a battered ship, with none of his staff left, and with very few dressings, lotions, or instruments.

The "Emden" was riddled with gaping holes; it was with difficulty one could walk about her decks, and she was gutted with fire.

The wounds of the Germans who were brought off to the "Sydney" by this time, only twenty-four to thirty hours after injury, were practically all very septic, with maggots ½ in. in length crawling over them. Little had been done for them, but now they were attended to by our party and transhipped to us as quickly as possible. The best arrangements possible under the circumstances were made for the reception and treatment of the wounded as they arrived. All blankets and beds available were drawn from store and most of us were left without our own beds and blankets. As they came inboard they were taken down to the temporary hospital in the wardroom, where Surgeon Todd and myself attended the more serious cases and directed the first aid party with the simpler dressings. I tried hard to keep the sick bay clear and ready for operations later, but we were soon crowded out of the wardroom, and the sick bay had to be used as a dressing station, the wounded being placed along the neighbouring corridors and spaces adjacent, and soon there was scarcely room to move. Besides the seventy wounded received that day, there were over

100 prisoners and twenty Chinamen from the sunken collier. The crowding can easily be imagined, especially as we were a full ship before.

Of necessity, the work done now was only immediate and temporary until the cases could be sorted out and put under anæsthesia in a clear theatre. From thirty-five to forty of them were serious, the remainder being more or less slightly wounded, who were able to help themselves somewhat and wait.

After having attended to the cases requiring immediate assistance, we cleared and cleaned up the theatre, for the constant stream of cases had left it in confusion. Operations had to be discontinued at noon, but we recommenced at about 6 p.m. and did not stop till 1.30 a.m. on November 12.

The first case taken was a German, whose right leg had been [illegible] severed just above the ankle. The German surgeon, assisted by Dr. Ollerhead, with Dr. Todd as anæsthetist, amputated the leg [illegible] in the middle third; the case did very well. We now [illegible] attention to our own patients and after dinner began with [illegible] O.S. (R.A.N.) who had over thirteen separate shell wounds, [illegible] of them severe; they involved the right buttock, thigh, leg [illegible]; both bones were fractured 2 in. above the ankle, and, [illegible] there was a large area blown out of his left groin, [illegible] the femoral vessels and spermatic cord. It looked at first [illegible] we should have to amputate, but we decided to give it a [illegible] and after cleaning up the wounds with soap and water, [illegible] and iodine, and removing all accessible foreign bodies, we [illegible] iodoform drains and put up the leg in a back and side [illegible]. This poor fellow had been in considerable pain; he was [illegible] under charge of a special nurse in the Commander's cabin. All [illegible] dressings had to be done under anæsthesia for about [illegible] days, but the latest report is that leg has been saved.

The next case taken that night was an A.B. (R.A.N.) who had a shell wound the size of a crown in his loin just below last rib on left side. Earlier in the day he had retention of urine, and a catheter was passed withdrawing almost free blood, so evidently the fragment had lodged in or passed through his kidney. Patient had had a good deal of pain, but apart from a pale colour his general condition was very good. Under chloroform the wound was cleaned up and I traced down the track of the fragment with a probe below the twelfth rib $2\frac{1}{2}$ in. from the vertebræ, but could feel nothing; the wound, which was foul, was enlarged with a scalpel and I tried to get my finger on to the metal, but without success. Eventually, from fear of carrying infection in too deeply,

I decided to wait and [illegible] the wound. The haematuria was [illegible] had no retention. He continued [illegible] there was no blood in the [illegible] well, but still with the fragment in [illegible] discharge from the wound. Later news [illegible].

After a spell of half an hour Dr [illegible] and myself, with the assistance of [illegible] cleared up instruments [illegible] and commenced operations again. [illegible] German with a shattered right leg, which was [illegible] mutilated in the middle third. The wound was [illegible] gangrene had set in, and infection was spreading [illegible] the thigh. This was thirty six hours after injury. [illegible] tourniquet round the leg just below the knee. [illegible] lost a good deal of blood, but his condition was [illegible] all things. Under chloroform it was decided [illegible] the knee. This was done by an anterior skin flap and [illegible] skin and muscle flap by transfixion post[illegible] was obtained with a very satisfactory stump, but he died of heart failure the next day.

Early on November 11 the sick berth staff attended [illegible] stream of less severely wounded who presented themselves at the sick bay. The remainder of the Germans who had got ashore on North Keeling Island, some of them wounded, were brought on board by a party from this ship which, on account of nightfall and the surf, had been unable to return on November 10. We next returned to Cocos Island and landed Dr Ollerhead, who was not able to come on with us. I cannot lay too much stress upon the great assistance so generously afforded by the Eastern Extension Company's Surgeon. Much to our relief the "Sydney" now sailed for Colombo at 20 knots, having had to spend some forty eight hours round the "Emden" after the action. We attended to the fresh batch of German wounded but only two were serious; one was put on the table in the forenoon and the other later in the afternoon.

An A B (R A N) was the first case to be taken on November 11. The distal half of his left foot had been shattered by a bursting shell, and there were numerous fragments buried in the tissue of the left leg and thigh. The outer side of the sole of his right foot was furrowed down to the metatarsals and one toe was carried away. With Surgeon Todd as anaesthetist and S B S Mullins (R A N) as assistant I cleaned up the wounds by now quite off nerve with H_2O_2, alcohol and ether, removing metal where

possible The left foot was amputated at the transverse tarsal articulation, sufficient skin and tissue having been obtained from the sole to make quite a satisfactory covering The case took some time owing to the number and state of the wounds a drain tube was left in the stump which healed quite quickly, and the patient is now convalescent During this operation the German surgeon was attending to the dressings of his fellow countrymen on the waist deck where they were taken after operation The sick berth attendant was overcome and had to be sent on deck for an hour to recover All this naturally added to our difficulties seeing that 50 per cent. of the staff was *hors de combat*

We next had another A B (R A N) taken to the sick bay for operation Dr Luther now was anæsthetist and Surgeon Todd assisted This man besides having a hole through the left palm and various shell wounds all up the right leg had a minute splinter which entered the right eye through the upper lid carrying a small fragment of the orbital bone into the eye and disintegrating that organ as it had become inflamed and swollen and a large amount of pus had collected in the orbit it was decided to remove the eye Patient is now reported to be convalescent

The next case was a German whose left forearm had been mutilated muscular tissue had herniated through the skin, and both large vessels had been severed A tourniquet placed round the lower third of the arm had saved the patient from bleeding to death, but amputation was necessary through the middle of the arm A drainage tube was inserted into the wound and the stump healed with little difficulty This man had refused to have the operation at first but eventually consented on the advice of his messmates and the German surgeon

Next case was similar to the above only his forearm was even more damaged, he had managed to get a tourniquet placed round the arm and was later blown overboard He had succeeded in swimming ashore through the surf and was brought off to this ship after being on shore about forty hours Besides the above injury he had a large flesh wound of left thigh, which afterwards became erysipelatous By the time he got to us all his wounds were very septic The patient was very weak from loss of blood and exposure and his life was saved on shore by our party who gave him cocoanut milk to quench his thirst through the night His constitution was wonderful and his stature and physique magnificent He appears to have been the only man on the upper deck saved Circular amputation in the middle of the arm was performed This case was somewhat difficult owing to the great muscular develop

[illegible] of the a[illegible] [illegible]factory st[illegible] however was obtained which healed well [illegible] three days the patient ran a very high temperature due [illegible] [illegible] [illegible] his left thigh

The remainder of this day (November 11) was occupied in cleaning up and dressing wounds and putting up fractures most of them under anaesthesia At midnight we went to bed after a spell of over forty hours without any sleep

Early on November 12 minor injuries were attended to in the sick bay In the forenoon we did general cleaning and dressing of wounds By night we had finished off all the operations and the bigger work as far as initial treatment was concerned but we had by no means been able to get up to the theatre all the cases which required careful and thorough attention

All this time we had to organize and arrange a hospital, with its equipment and the feeding and nursing of patients up to now this was turned over to the first aid and volunteer nursing party and they received the cases straight from the theatre In the case of the Germans we had a party told off from the prisoners to help our staff We had two large wards the wardroom and the waist deck and various special wards a few cabins being given up by officers Our wounded were in the wardroom, but were sometimes carried on deck as it was very hot below The Germans filled the waist deck, and though cooler here they were very much exposed to heavy rain in spite of extra awnings side curtains and sweepers told off by the Commander A special party under the chaplain was organized to look after the feeding of the patients The moving of wounded to and from the sick bay was considerable, and in consequence of narrow hatchways and doorways, combined with limited space, it was rather difficult work The stretcher parties were kept very busy and responded well to the call on them

By nightfall one could look round with a feeling that some impression had been made on the work and later that evening the German surgeon and myself went round sorting out the cases, we could send off next day to the 'Empress of Russia,' an armed liner which had been dispatched to help us with the wounded and relieve us of our 230 extra men

This ship joined us at 10 a m on November 13 and we had all the wounded ready for transhipping Fortunately, the weather was calm, and about 60 patients besides 100 prisoners were moved within two hours We sent over all the cases that could walk and about 25 to 30 cot cases, and but for the fact that we had to wait for our cots to be returned to send over more patients we should have finished much sooner We also transhipped

18 Chinamen the [illegible] and then we had [illegible] clear space on [illegible] wounded. We had kept [illegible] all. I retained all [illegible] men and the severest [illegible] the German [illegible] had operated upon [illegible] thought [illegible]. A fresh supply of [illegible] was obtained [illegible] and most [illegible] bedding and [illegible] as they were [illegible] and offensive [illegible] disinfecting them [illegible] time. We [illegible] being much [illegible] and [illegible] the remaining cases better and were able to take [illegible] dressings of and examine the cases we had operated upon [illegible] in the week. Between now and the evening of November 14 we had given each case a thorough overhaul and were [illegible] to discharge them to hospital on November 15 in a fairly clean [illegible] though most of them were more or less septic.

We arrived in Colombo at 10 a.m. on November 15, when the military took over the wounded, placing them in the Station Hospital till that was full, and the remainder in the Civil Hospital.

After the wounded left the ship it was some time before she could be cleaned, as we were coaling for nearly two days. The corticene decks of the wardroom and bay and starboard corridor had to be stripped, as they were fixed with marine glue, which was unavoidably fouled by dressings and discharges from wounds. All these places were then well scrubbed out, and next day the Colombo health authorities came and sprayed out with cyllin the whole of the living spaces in the ship.

Some of the bedding was destroyed, and the remainder was put through the steam disinfector. Numerous heavier articles such as gymnasium mats, which had been used as beds, were sent ashore to be disinfected.

At 9 a.m. on November 17 we left Colombo after having gone through a very trying ten days. It would be very difficult to imagine a more severe test for the medical staff of a cruiser, and an action where so many wounded could be rescued. Thus we had an abnormal list of wounded from the enemy's ship added to our own. The ship was overcrowded and most unsuitable at any time as a hospital ship. We were delayed forty-eight hours round the scene of action and were four days steaming at 18 knots from the nearest hospital.

The best antiseptics were found to be hydrogen perchloride and iodine with alcohol; hydrogen peroxide was most useful for septic wounds.

SYPHILIS IN THE NAVY

By Staff Surgeon JOHN S. DUDDING, R.N. (R.N. Hospital, Haslar)

YEAR by year each Naval medical officer receives a copy of the Blue Book, the "Statistical Report of the Health of the Navy." There are found in it statistical details in the various diseases occurring in the Navy.

It is an interesting and useful study to compare these statistics connected with the various diseases over a period of years, with a view to ascertain what progress has been made either in diminishing the incidence of certain diseases, or in diminishing the time lost to the Service by each entry of these diseases. These Statistical Reports give the result of our endeavours in combating disease, and the study of them shows how these endeavours are proceeding. The work of the Naval medical officer is judged as regards disease by two facts—the number of cases of disease which occur, and the number of days which the Service loses by sickness arising from disease. The former concerns the preventive treatment of disease, the latter the treatment after the disease has been contracted.

For the purpose of this paper syphilis has been taken as the disease for investigation. The object is to endeavour to promote an improvement, and to diminish the large number of days which are annually lost to the Service by this disease as shown by the statistics.

In the "Health of the Navy," 1912, there appears the following criticism as regards syphilis under the heading of "Venereal Diseases": "*This reduction in the time lost to the Service chiefly attributable to the use of salvarsan as a treatment is not so great as was anticipated, especially with regard to the days' sickness in hospital.*"

This is a striking paragraph to those who are interested in the treatment of syphilis in the Navy, and one which calls for investigation to discover the causes which give rise to evidently disappointing results. It is hoped in this paper to endeavour to trace and investigate some of these causes, and also to indicate modern lines of treatment which will be of help in bringing about an improvement in the statistical returns.

A study of the statistics of syphilis as shown in the "Health of the Navy" since the year 1908 is instructive. It is only since

that date [illegible] use for previously all primary sores whether [illegible] were classified as syphilis primary [illegible] has been made to differentiate [illegible] syphilis but this differentiation can only [illegible] owing to the difficulties of diagnosis [illegible] As the modern methods of [illegible] general the diagnosis will [illegible]

[illegible] for present purposes —

(1) [illegible] the Navy as judged by the [illegible]

(2) [illegible] the invaliding and death rate

(3) [illegible] Service in days [illegible] of syphilis

(1) [illegible] of Syphilis [illegible] the Navy

The foll[illegible] the rate per 1,000 of admissions from 1905 to 1913 —

Year	[illegible]	Year	Admissions
1905	[illegible]	1910	34.2
1906	[illegible]	1911	30.8
1907	[illegible]	1912	28.9
1908	[illegible]	1913	22.4
1909	37.5		

These figures show that there has been a steady decrease in the number of cases admitted. This decrease is attributable to a number of causes, chief of which is the wave of sobriety which has been, and is, an increasing factor in the life of the modern sailor, as well as to an improved general moral tone. The improvement in treatment which has taken place since the advent of mercurial cream injections has also been an important factor in lessening the number of cases of relapse.

(2) The Statistical Effect of Syphilis on Invaliding and Death

The following table gives the rate per 1,000 of invalidings and deaths from 1905 to 1913 —

Year	Invaliding	Death
1905	[illegible]	0.02
1906	1.59	0.03
1907	1.49	0.05
1908	0.81	0.05
1909	0.91	0.06
1910	0.7	0.05
1911	0.52	0.02
1912	0.69	0.03
1913	0.4	0.01

There has been [illegible] in the number of cases invalided, as would [illegible] a gradual declining incidence. The death rate has [illegible] but it is satisfactory to find that in the past [illegible] there has been a distinct tendency to a fall. [illegible] of these statistics undoubtedly shows that [illegible] a most marked decrease in the number of cases [illegible] the Navy, and this is most satisfactory.

It is when we consider [illegible] of statistics that we are faced with the meaning, [illegible] from the 'Health of the Navy' already quoted.

(3) The Number of Days Lost [illegible] Service by each Case of Syphilis

The following table gives the [illegible] days for each [illegible] from 1905 to 1913:—

Year	[illegible]	Year	[illegible] days
1905	31 [illegible]	1910	33 8
1906	32 5	1911	33 5
1907	33 [illegible]	1912	30 9
1908	33 8	1913	31 9
1909	33 3		

The statistics show us that, whilst a satisfactory decline in the number of cases of syphilis is taking place, no marked progress has been made in diminishing the number of days lost per case in sickness.

This is surprising, for since 1911 salvarsan treatment has been applied in general use in hospitals, and yet little practical benefit has been shown by the statistics in the lessening of the days sickness. In this same period there can be no doubt that benefit has been obtained in diminishing the numbers of cases admitted for relapse. In spite, then, of having at our disposal all the modern methods of treatment, the Service is not deriving the benefit that would be expected.

As to the beneficial results of salvarsan and neo-salvarsan treatment there can be no doubt. It remains to find out whether we are making full use of these valuable drugs, for statistical results are disappointing.

On p. 7, 'Health of the Navy,' May, 1912, is found under the heading "Venereal Disease" [illegible] 'The cases include 715 primary syphilis, 2,744 cases secondary syphilis.' These cases of secondary syphilis may be presumed to consist of (a) undiagnosed or

inadequ[illegible] syphilis which [illegible] the primary stage and [illegible] secondary [illegible] relapse. Experience [illegible] that [illegible] figures will consist chiefly of cases that have [illegible] and inadequately treated until secondary symptoms [illegible] developed. These figures are important for present purposes. It will be noted that the ratio of primary syphilis to [illegible] is as 715 is to 2744, i.e., practically 1 to 4. We [illegible] with a disease which we know must [illegible] stage pass through a primary stage. The [illegible] in the majority of cases, be easily diagnosed by [illegible] methods. Yet statistics show that [illegible] only one case out of five is diagnosed and treated [illegible] the secondary stage.

It is known that the [illegible] from salvarsan by its use in the [illegible]. The earlier in the [illegible] of a rapid cure, the better the [illegible] and also the smaller the chance of relapse. [illegible] that the majority of cases of syphilis [illegible] until secondary [illegible]. It is [illegible] that the period, the early [illegible] in which the [illegible] salvarsan treatment should be [illegible] and it is not until [illegible] with [illegible] symptoms has [illegible] that we are in a [illegible] use of a valuable treatment. [illegible] treatment of syphilis [illegible] satisfactory the ratio of primary syphilis to secondary [illegible] would be nearer 4 to 1 than as at present 1 to 4, [illegible] treatment in the primary stage few cases would [illegible] the secondary stage.

The reason why these cases [illegible] is that they are not [illegible] early enough and this [illegible] to the problem [illegible] why the Service is not [illegible] the maximum benefit which salvarsan treatment offers. Attention [illegible] been previously drawn to this by Staff Surgeon F. B. [illegible] and Surgeon G. B. Scott.

It behoves us to diagnose [illegible] as possible in order to administer salvarsan treatment as early as possible. The immediate result would be a [illegible] the number of secondary cases, and a great stride would be [illegible] towards obtaining perfection in treatment by cutting short syphilis in the primary stage, and effacing secondary syphilis from the statistics. The time should be near when a diagnosis [illegible] syphilis will indicate carelessness on the part of the patient in not reporting his disease, or on the part of the medical officer [illegible] failure in diagnosis.

Having stated that the earliest possible diagnosis of syphilis is of the utmost importance, it may be useful to survey the methods of diagnosing the disease [illegible] for with present knowledge this is the earliest tangible sign presented.

(1) Clinical.

(2) Microscope. (i) Dark ground illumination. (ii) Burri's Indian ink. (iii) staining.

The clinical examination [illegible] of great value, [illegible] and experience leads one to look on the microscopic methods as the most useful and absolutely necessary. [illegible] *microscopic methods* but the easiest and most important is the dark ground illumination, which is unfortunately at present not practicable for ordinary ship's use. Burri's Indian ink [illegible] to the Navy, and, with a little practice, is very [illegible] special value for work in ships. The staining methods [illegible] strating the *Spirochæta pallida* are not very [illegible] for general use. Every case of sore of venereal origin should be examined by the means at our disposal, and if any doubt exists the case should be sent to hospital for diagnosis.

I have not included in the above the diagnosis [illegible] Wassermann reaction. It is not generally realized that it takes some time, sometimes weeks, before a positive Wassermann is obtained in early syphilis. It constantly happens that the bloods of cases of early syphilis are sent to the laboratory for diagnostic purposes and a negative Wassermann is the frequent result. In consequence the case is assumed to be non-syphilitic, and no adequate treatment is given. Sooner or later a considerable number of these cases develop secondary signs. They are then sent into hospital for treatment, the case sheet not omitting to state that this man had a Wassermann test done, and the result was returned as negative. The majority of these cases could have been diagnosed early if, instead of relying on the Wassermann test for an early diagnosis, the spirochæte test had been applied. Syphilis should be diagnosed at a stage when the spirochæte test is positive and the Wassermann negative.

The Effect of Previous Treatment on Diagnosis by Examination for Spirochætes.

For many years past it has been the custom in the Navy to treat practically every sore of venereal origin with black wash as soon as the man presented himself at the sick bay. The treatment is often excellent in its immediate effect: the sore heals and the

[illegible] tne, however many of [illegible] and are sent to hospital [illegible] daily with the history [illegible] month ago The sore was [illegible] As he has developed a [illegible] hospital for treatment"

[illegible] before diagnosis has been made and th[illegible] to the Service Under the action of m[illegible] the secondary symptoms are only del[illegible] are driven from the upper surface of the [illegible] must elapse before it is possible to find th[illegible] been definitely diagnosed as syphilis, the [illegible] indicated Cases of sore with bubo are [illegible] the sore having been treated with [illegible] without a definite diagnosis having [illegible] Owing to the action on the [illegible] it is [illegible] examining these sores until several days [illegible] appropriate [illegible] have elapsed The diagnosis is in[illegible] delay[illegible] delay in treatment, injurious alike [illegible] the Service [illegible] the patient

The indiscriminate [illegible] antiseptics especially black wash to undiagnosed sores is [illegible] to our statistics and at Haslar the order [illegible] No sore [illegible] venereal origin is to be treated with antiseptic applications until the nature of the sore has been determined

We may now consider the second part of the criticism in the Health of the Navy [illegible] quoted "This reduction in the time lost to the Services is not so great as was anticipated *especially with regard to the days sick in hospital*" It has been shown that two impediments to the early diagnosis of syphilis are (1) the dependence of diagnosis on the Wassermann test and (2) the indiscriminate use of antiseptics especially lotio nigra to sores before a diagnosis is made These factors have a great influence on hospital statistics in that instead of cases being admitted for treatment in the primary sore stage they are not admitted until the later stages of the disease In these cases in addition to the primary symptoms there are the symptoms of general infection ulcerated throats mouth and nose general adenitis, often complicated with suppurating buboes condylomata requiring operation eye symptoms and all the other features of neglected syphilis, some of which require prolonged treatment There are also a large number of days lost through the delay in the diagnosis examination

[illegible] by the previous antiseptic treatment of the sore. The [illegible] is not due to a defect in the salvarsan treatment in hospital, so much as to the causes which prevent the early diagnosis and treatment of the disease.

The Outlines of Syphilitic Treatment at the Royal Naval Hospital, Haslar

In the venereal wards there are two orders which are given to medical officers on joining:—

(1) No antiseptic is to be applied to venereal sores until the nature of the sore has been determined.

(2) Every sore is to be examined as soon after admission as possible for the presence of *S. pallida*. Active treatment is delayed until the sore has been diagnosed chancre or chancroid. On admission the sores are treated with white lint soaked in saline solution, and the penis is protected by a bag made of impervious batiste. The sores are examined daily for spirochætes. If *S. pallida* are found, treatment by neo-salvarsan is given as soon as possible. If no spirochætes are found on the first day examinations are carried out over a period of a week. If on four occasions in the week no spirochætes are found, the diagnosis is made of chancroid unless physical signs are suspicious. If the case has been previously treated with black wash, a period of three or four days under saline treatment is necessary before there is any hope of finding the spirochæte. Once the diagnosis has been made any treatment considered necessary is applied. At Haslar the most satisfactory local applications have been found to be black wash, ung. calomel, and sprays containing perchloride or biniodide of mercury. These sprays, suggested by Mr. Cheatle, are found to be of great convenience and value in general syphilitic treatment, especially in condylomata and rupial ulceration. They are also of value in the treatment of bubo wounds after excision.

Composition of perchloride spray: Hyd. perchl., 3 parts; rosalane,[1] 1 part; alcohol, 80 per cent. to 1,000.

Composition of biniodide spray: Hyd. biniodi, 2 parts; pot. iodi, 2 parts. Dissolve in water, 10 parts; fuchsin, 1 part; alcohol, 90 per cent. to 1,000 parts.

Fuchsin ointment has also been used with success, especially in treatment of chancroids. Excision of the sore is carried out if possible.

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[1] As rosalane is difficult to procure at present, malachite green may be used in lieu.

The Treatment by Neosalvarsan.—The routine is as follows When admitted *for the first injection* the patient goes to bed for two days, during which period his general condition is investigated especially [illegible] urine The evening previous to injection [illegible] oil is given On the day of injection (i e, the third day) no food is given before and for four hours after injection, low diet being ordered for the day

The injection is made intravenously into the arm, a full dose of neosalvarsan being dissolved in 100 c c redistilled water Maximal doses are given unless there are contra indications No ill effects have ever followed the injection Cases of reaction with pyrexia, headache, vomiting with rash, or increasing intensity of rash occur, but these cases are almost always found to be in the late primary or early secondary stage of the disease It is easy to judge after a little experience what cases will have a reaction It is advisable to caution these patients beforehand, for then they are not frightened when the temperature rises and a short uncomfortable period occurs

After injection the patient is put to bed where he remains for three days I think this period before and after injection errs on the cautious side and its reduction would certainly improve the statistical results The urine of all cases is examined for arsenic for three days after injection, and in every case, except one out of 1 100 injections, has been present The case in which no arsenic could be demonstrated showed no ill effects

Mercury is given on the day after injection, generally in form of hyd c cret 2 gr t i d

Patients admitted *for the second and third injections* are retained in hospital only for a period of two days if they have no active signs of syphilis being kept in bed for the day before and the day after the injection and discharged from hospital on the third day

When the patient is discharged to his ship a syphilis case sheet accompanies him detailing the treatment he has received A note is made recommending continuous mercury treatment, which is best carried out by injection of mercurial cream The men are also advised to have a Wassermann blood test every three months

The usual routine is to give each case two maximal doses of neo salvarsan at an interval of a month, and the after-treatment depends on the result of the Wassermann test and the progress of the disease The period of treatment depends on the case

If neo salvarsan is injected early in the disease results indicate

[illegible] mercury lasting three months. [illegible] necessary at all in these cases.

In the [illegible] the Wassermann has become positive it is advised [illegible] for two years or until the Wassermann [illegible] over a period of nine months. In the latter case a further three months is allowed to elapse without mercury and the Wassermann again tested. If the Wassermann still gives a negative result the disease is probably cured.

The evidence that the above method of treatment is satisfactory is borne out by the small number of relapse cases that occur. It remains to be proved by time whether a cure is absolute or only temporary.

I am afraid that this paper has nothing new to offer as to the treatment of syphilis but it is written as the result of experience gained in the venereal wards at Haslar, with a view that it may be of some use to the Service and may help to bring about the greatly desired decrease in the total days' sickness from this disease.

THE BACTERIOLOGICAL EXAMINATION OF CONTACTS WITH CEREBROSPINAL FEVER AND THEIR TREATMENT

By Fleet Surgeon HENRY C WHITESIDE R N

Royal Naval Hospital Plymouth

During the recent epidemic of cerebro-spinal fever much attention has been directed to the subject of 'carriers' of the meningococcus of this disease It may therefore be of interest to hear an account of the investigation on this matter which it has been my privilege to carry out in the laboratory of the Royal Naval Hospital at Plymouth during the past few months

Sporadic cases first made their appearance in Plymouth and Devonport towards the end of December, and the first naval case was admitted to hospital on the 22nd of that month, but it was not until February that the epidemic began to assume an alarming aspect During this month sixteen cases were admitted, all being of a very severe type no less than seven terminating fatally In March and April ten cases were admitted, the majority being of milder type with one death only The total number of cases treated in hospital was twenty-seven, with a case mortality of 29 per cent

In addition to these one boy from the 'Impregnable' developed the disease while on short leave at Torquay and another boy shortly after being drafted to Portsmouth One of the hospital cases came from the 'Ajax' and the medical officer (Fleet Surgeon L Kilroy) informed me that the patient had probably contracted the disease while on shore (place not mentioned) some thirteen days before being taken ill

It will be seen, therefore that the naval and marine personnel of this port supplied twenty eight cases in all not a great number when it is considered how many men and boys have been under training in the various establishments

During the early stages of the epidemic it was found impossible to do more than examine the 'close contacts' these being defined as 'persons who had slept in close proximity to the patient, or who were in the same mess or otherwise brought into close relationship with him

But later on as sporadic cases kept appearing in the Naval Barracks, it was decided to examine a much wider circle of contacts, including all those who slept in the same room or were in the same training class as a patient

The Examination of Close Contacts

In accordance with orders received from the Director General all close contacts were admitted to hospital at Haslar, with 108 beds being set apart for their accommodation, and when necessary part of another block was also used.

The first batch of contacts numbered 123 boys from the "Impregnable," where five cases of cerebro-spinal fever occurred between February 8 and 12; twenty-five of these were found to have meningococci in their naso-pharynges. The remainder, after thorough disinfection, were sent back to duty, with the exception of fourteen boys who, having more or less severe catarrhal affections, were regarded with suspicion and retained for further observation. A second examination of these boys yielded six more carriers, bringing the total number of the batch up to thirty-one.

Of these detected carriers two have subsequently developed cerebro-spinal fever, one on the third, the other on the twelfth day after admission to hospital, these two cases proving to be the only two instances of carriers who have developed the disease in the whole series; and it is noteworthy that both have made an excellent and speedy recovery, although the onset and early symptoms were acute in both cases. A further batch of twenty-five boys was admitted on February 22, being contacts with the case reported as having occurred in the person of a boy while on short leave at Torquay. Amongst these nine carriers were found.

The Naval Barracks have supplied nine cases, and sixty-six close contacts were admitted to hospital, fourteen of whom were found to be carriers. The Youths' Training Establishment supplied three cases and twenty-two contacts, no less than twelve of these proving to be carriers. (It is to be noted that this establishment is part of the Naval Barracks.)

The Marine Barracks had three cases; thirty-one contacts were admitted to hospital, nine proving to be carriers. Here the barrack rooms are small, with sleeping billets for about eleven men; hence the selection of contacts resolved itself into simply taking the inmates of the room in which the cases occurred. The "Indus" and "Powerful" had two cases each; eighteen contacts were sent to hospital from the former ship, and fifty-five from the latter.

The benefit accruing from immediately segregating large batches of contacts, as was done by the "Impregnable," the "Powerful," and Marine Barracks, is well brought out. Thus the focus of infection in the "Impregnable" must be considered to have been

virulent [illegible] with [illegible] days and two [illegible] later [illegible] thought that [illegible] it would [illegible] been [illegible] in a large [illegible] of this kind. However, after the removal of the [illegible] no more cases occurred until April [illegible] when a single [illegible] within a day or two after being drafted [illegible] and it is doubtful whether this had any connection with the previous instances, as the Medical Officer (Fleet Surgeon [illegible], M.B.) informed me that this boy only joined the Service exactly one month after the last case had died at Torquay.

In the Marine Barracks and in the "Powerful" there were no further cases after the contacts had been segregated. On the other hand in the Naval Barracks, including the Youths' Training Establishment, where the difficulty of selecting contacts is great owing to the non-permanence of the sleeping billets and the large size of the messes, sporadic cases kept cropping up at irregular intervals.

The Examination of Remote Contacts

This was commenced about the middle of April, and was continued until it was thought that practically all possible contacts in the Naval Depot had been examined. Whenever a case occurred it was arranged that the contacts should be marched to the laboratory in batches of not more than sixty each day for swabbings to be taken, the process being continued until all possible contacts had been worked through. It was understood that the original arrangement of taking "close contacts" direct into hospital should continue as before.

When the examination was completed on the day following the swabbing, notification of the carriers detected was made to the Senior Medical Officer of the Depot and the individuals were forthwith sent to hospital for the routine isolation and disinfection.

Combining the figures in the following two tables it will be seen that a total number of 1,396 individuals were examined, and 147 of these were found to carry the meningococcus in their nasopharynges, a percentage of about 11.

This at first sight would appear to be an alarming proportion to be infected, but when it is considered how widespread was the epidemic and that sleeping billets in the Naval Barracks are of necessity somewhat crowded, I do not think that the results obtained can be called unexpected.

TABLE I shows the Number of Cases of Cerebro-spinal Fever from the [illegible] Establishments, the [illegible]ing "Close Contacts" with the Numbers and Percentage of the "Carriers" [illegible]

Ship or establishment where case occurred	[illegible]	[illegible]	Number of contacts [illegible]	[illegible]
H.M.S. "Impregnable"	8	118	10	8
General Depot	3	11	11	1
Youths' Training Establishment	8	91	11	
R.M.L.I. Barracks	1	31	1	3.3
H.M.S. "Indus"	3	18	3	16.6
H.M.S. "Powerful"	2	[illegible]	15	[illegible]
H.M.S. "Ajax"	1			
Totals	38	3[illegible]	11	3 per cent

One case occurred on shore and was not admitted [illegible]
Two of the [illegible] admitted as contacts developed [illegible] in hospital

TABLE II shows the Number of Remaining Contacts Examined with the Numbers and Percentage of Carriers Detected

Establishment	Numbers examined	[illegible] found	Percentage found
General Depot	389	41	11.6 (nearly)
Youths' Training Establishment	667	30	[illegible]
Total	1 056	71	7 per cent

Method of Examination of Contacts

Swabbings were taken from as high up the naso-pharynx as possible, great care being taken not to infect the swab by touching any part of the mouth or fauces.

In this connection I may say that I have found the form of swab known as "West's guarded throat swab" to be almost essential. It was first brought to my notice early in the course of the investigation by Dr. Warren Crowe, who was doing similar work in the laboratory of the Military Hospital at Devonport. The swab is easily made and can be readily cleansed and sterilized.

[illegible] the upper part of the naso-pharynx can be reached [illegible] the aid of a speculum and the risk of oral contamination is [illegible] minimum. It consists of a wire with holder enclosed [illegible] length of glass tubing bent at an obtuse angle about an inch [illegible] one end; the wire is held in position by reason of its flexibility and can be extruded from the short arm of the [illegible] to the extent of about an inch.

The swabbing being taken, the wire is withdrawn from the [illegible] and plates are inoculated then and there, the inoculum being smeared over the surface of the medium with a sterile glass [illegible]. The plates are then put into the incubator at 37° C. for [illegible] four hours at the end of which time they are inspected, [illegible] fished and film preparations made. The practice [illegible] swabbings sent from ships was early discontinued as [illegible] found that at any rate during the cold weather, the meningo[illegible] [illegible] not survive, for in some sixty swabs sent to the [illegible] in this manner I failed to find the organism in any, [illegible] subsequent examination of swabs taken from the same [illegible] in the laboratory a definite percentage of the swabs [illegible] found to be positive.

It must however be observed that during a small epidemic [illegible] during the warmer months of May and [illegible] it was found quite possible to obtain growths of the diplo[illegible] [illegible] swabs taken on board and brought to the laboratory [illegible] two or three hours.

[illegible] I have not found it possible to allocate a separate [illegible] owing to the large number of cases dealt with [illegible] limited incubation space at my disposal plates have [illegible] been marked in sectors on their under surface with a [illegible] pencil from [illegible] six sectors according to the size of the plate [illegible] representing one case. This method has been found [illegible] be quite satisfactory, it being exceptional to find a contaminated plate. On a few occasions when the stock of plates happened to be all in use, [illegible] tubes have been substituted with equally good results, but the method is much more laborious and the tubes take up a disproportionate amount of room in the incubator.

With regard to culture media I have found Buchanan's blood serum medium to be quite the most useful to work with; it is easily made, provides an excellent surface for smearing and yields an abundant growth of the meningococcus within twenty four hours, the colonies of which are distinctive and easily recognized. Nasgar and a human blood serum medium have also been tried but have been discarded because of the uncertainty of being able

to procure a continuous supply of their chief ingredient [illegible] fluid or human blood, whereas bullock's blood serum could be obtained daily with little trouble thanks to the courtesy of Mr Savage, the Inspector of the Royal William Yard

With regard to the identification of the colonies I have [illegible] found it practicable to do subculture controls on saccharose and maltose litmus media as has been recommended but have [illegible] on the macroscopic appearance of the colonies on the [illegible] medium, and the microscopic examination of film preparations stained by Gram's method and am of opinion that after [illegible] facility in recognition has been acquired the control test [illegible] an absolute necessity in any case the margin of error is small and if anything is on the side of over rather than under estimating the number of carriers, a matter of some importance in view of the fact that the investigation is undertaken for the purpose of identifying and segregating all carriers and thus preventing the spread of the disease

The Treatment of Contacts

As has been stated above all the "close" contacts to the number of 340 were segregated in the hospital together with the seventy-four carriers detected amongst the remoter contacts

In dealing with the "close" contacts on initial examination was made before using any method of disinfection the detected carriers were separated from the non-carriers at the earliest possible moment the latter were then re-examined and if found to be clear they were then disinfected and discharged from hospital

The carriers were subjected to a routine treatment with a view to getting rid of the organism from their air passages This consisted in nasal douching with weak permanganate solution and swabbing the fauces with glycerine and iodine other disinfectants such as weak Listerine solution peroxide of hydrogen &c [illegible] also been tried but I consider the most satisfactory method to be the above mentioned simple douching with permanganate solution at least three times daily Other details, such as disinfection of clothing towels &c, have been carefully carried out and every case is provided with a clean piece of rag each morning in lieu of a handkerchief at the same time the soiled rag of the preceding day is collected and burned The most careful attention has been paid to the ventilation of the wards occupied by carriers and all windows have been kept widely open The carriers were ordered to be in the airing grounds as much as possible whenever the

[illegible] in the nasopharynx [illegible] no discharge [illegible] the swab. [illegible] negative result he was regarded [illegible] discharged [illegible].

[illegible] treatment has been found to be quite satisfactory [illegible] cases but a few have proved very recalcitrant [illegible]

B[illegible] —

[illegible]	March 1	March 10 +	March 22
Mar[illegible]	April [illegible] +	April 16	May 1 +
May [illegible]	May 10	Duty	

Stok[illegible]

Feb [illegible]	March 1 +	March 10 +	March 32
March 30 +	April [illegible]	April 16	Duty

These two are, however, extreme cases and the average length of time for a carrier to be kept in hospital has been only about three weeks.

The liability of carriers to contract the disease themselves would not appear to be great, for of the 167 under observation two only have developed the disease.

The detection and segregation of carriers is undoubtedly a valuable method of limiting the spread of the disease amongst large collections of people, and in conditions such as obtain in barracks, camps or ships the problem can be dealt with, but in civil communities it would be a matter of extreme difficulty and I am doubtful if it could be ever effectively carried out.

It is interesting to note that in the course of the examination of the 1,996 cases I found four apparently healthy individuals who were carriers of the Klebs-Loeffler bacillus; as a precautionary measure they were admitted to hospital and were treated by local disinfection in the same manner as the meningococcus carriers. In conclusion, I desire to express my thanks to the senior medical officers of the various ships and establishments for their cordial assistance in sorting out and sending contacts to the hospital for examination; and to the two sick berth stewards (my laboratory assistants), who have worked indefatigably in the preparation of the large quantities of media and apparatus required, and who have been of the greatest assistance to me in the whole course of my work.

EPIDEMIC CEREBRO-SPINAL MENINGITIS: A REPORT ON THIRTY-ONE CASES

By Staff Surgeon [illegible]

[illegible] Surgeon A. [illegible]

During the recent epidemic [illegible] cases have been treated in the Royal Naval Hospital, Haslar. These have occurred over a period of [illegible] of January to the second week in May. [illegible] evenly distributed over this period but fell [illegible] groups; 13 cases occurred during the first month [illegible] February 10 and 9 between March 9 and [illegible] the intervening month only 2 cases were admitted, and the [illegible] 7 occurred at irregular intervals, between March 30 and May [illegible] the date of the last case.

There appeared to be some connection between weather conditions and the number of cases admitted, [illegible] being more numerous after an abrupt change in the [illegible] conditions, i.e., under conditions favouring the prevalence of naso-pharyngeal catarrh.

Etiology

The origin of the epidemic is, as might be expected, very difficult to trace. The first cases occurred at the R.M.A. Barracks, Eastney, shortly after the outbreak of the epidemic in the Canadian Camp at Salisbury, and Dr. H. D. Rolleston, consultant physician to the Hospital, made an exhaustive inquiry into the possibility of the infection having been conveyed from that source. We are indebted to him for the following information. On January 9 a team of Canadians came from Salisbury to Eastney to play football against a R.M.A. team and spent the night in barracks. The first case at Portsmouth occurred in a private of the R.M.A. at Eastney Barracks on January 1[illegible], six days later. It is known that cerebro-spinal fever had occurred among the Canadians at their camp in Canada, on the voyage, and on Salisbury Plain, but none of the Canadian team are known to have been carriers or to have contracted the disease after their visit, and none of the opposing Eastney team contracted the disease. Swabs from their throats were sent to Greenwich and were all negative. The Canadians slept in a separate room and for the most part kept to themselves.

[illegible] were however [illegible] round the town by a member of the [illegible] who was a friend of the private who first contracted the disease and this private was also in daily contact with the two [illegible] who next succumbed It will be seen that to establish a con[illegible] between the Canadian and the Portsmouth epidemic it is [illegible] to suppose the existence of two carriers neither of whom [illegible] contracted the disease one a member of the Canadian [illegible] and the other a member of the Eastney team It is possible [illegible] this is the case and it is interesting to note that not only did [illegible] cases come from Eastney Barracks, but that the [illegible] civilian cases in the town occurred among school children [illegible] in a room used by the Eastney recruits On the [illegible] the almost simultaneous outbreak of the epidemic in [illegible] parts of the country the weakness of the direct evidence [illegible] and the fact that cases of the disease occurred in the [illegible] before, make it more probable that the epidemic was [illegible] pre existing carriers, and is not attributable to the [illegible] contingent

The epidemic was not localized to Eastney of the 31 cases, [illegible] from the Royal Naval Barracks Portsmouth 11 from the R M A Barracks Eastney, 4 from the R M L I Barracks Forton and 1 each from the 'Excellent' the 'Vernon', and the 'Fisgard' Of the Forton cases the first two came undoubtedly, from Deal and the third and fourth from houses in Gosport where there was a small epidemic No case originated in the barracks themselves The first case admitted from the Royal Naval Barracks had come from Chichester the day before the illness started

The majority of the cases were in men under 20 years of age, and it was remarkable how many of them were either boys or recently joined recruits No less striking is the variation in the mortality dependent on the age of the patient These two facts are shown in the accompanying table —

Age of patient	Number of cases	Recoveries	Deaths	Mortality per cent.	Average age of patient
Between 10 20	20	13	7	35	$17\frac{1}{10}$ years
Over 20	11	2	9	82	32 " (includes 1 patient aged 55)
Total	31	15	16	52	$22\frac{4}{10}$ years.

These facts bear out [illegible] that the incidence of the disea[illegible] (2) that its virulence incr[illegible] outbreak of a widespread ep[illegible] time they also emphasize th[illegible] occurring in military establishments the d[illegible] of recruits. This strongly suggests that one of the pr[illegible] causes of infection is excessive fatigue but it has not been p[illegible] to corroborate this individually in more than one of th[illegible] cases. A second possible interpretation is that it is [illegible] the presence of adenoidal and tonsillar hypertrophy and the consequently increased liability to naso-pharyngeal infection. Probably both factors play their part.

Clinical Picture

In his account of the disease Sophian[1] describes three types (1) ordinary (2) fulminating and (3) abortive. In this series one fulminating and one abortive case occurred, the remainder all fall under type (1). The fulminating case was a good instance of the most virulent form which the disease can assume. H—— W——, a man aged 51, who was known to have been strongly addicted to alcohol returned home on the evening of March 9 apparently in good health. At 8 p.m. he suddenly collapsed, and when seen by his shore doctor was quite unconscious with a very weak and rapid pulse and apparently moribund. There had been no complaint of headache or pain of any kind and no vomiting and there was nothing to indicate the nature of his disease. The following morning he was still completely unconscious, temperature 102 F, pulse 136, respiration 40. His tongue was furred and dry, his face flushed and his breathing irregular of the Cheyne-Stokes type. During the day some râles were heard at the right base and a petechial rash appeared on the trunk and limbs. A provisional diagnosis of cerebro spinal fever was made and he was admitted to hospital the same evening. On admission he lay in deep coma with head and eyes deviated to the right, and deep and superficial reflexes were abolished. Breathing was Cheyne Stokes in character. The body was diffusely covered with a fine purpuric rash which was most marked on the abdomen and arms. Lumbar puncture—to which no resistance was offered—yielded 10 c.c. of thickly turbid fluid which contained numerous Gram negative

[1] Sophian, "Epidemic Cerebro spinal Meningitis," St. Louis 1913.

diplococci chiefly extracellular. Serum [illegible] was injected intramuscularly, but the patient failed to respond, and died at 8.40 a.m. on March 11—thirty-six hours after the onset. Before death the rash had developed into a profuse blotchy purpura, and at the autopsy similar ecchymoses were found along the walls of the stomach and small intestine; there was thick exudate at the base of the brain, and extending widely over the vertex cerebri.

The abortive case was admitted on April 4, with a history of headache, vomiting, and malaise of twenty-four hours' duration. On admission the patient, I—— B——, complained of severe frontal headache and pain in the neck; temperature 101.4° F. He had rigidity of the neck muscles and Kernig's sign, and there was a macular erythematous rash on the legs. Lumbar puncture produced turbid fluid which contained a small number of Gram-negative diplococci. Soamin 5 gr. was given intramuscularly. On the following day the temperature was normal and he was distinctly better. The symptoms rapidly subsided, the temperature remained practically normal, and within a week recovery was complete.

With these exceptions all the cases belong to the ordinary form, in which there is typically an acute onset of severe headache, pyrexia, and vomiting, with rapid alteration of the mental state, [illegible] previously in robust health. On examination the patient [illegible] either in a hypersensitive irritable state or in a definitely [illegible] condition, which may vary from drowsiness to mania. If sufficiently conscious, he complains of severe headache, and [illegible] of pain in the neck, back, and limbs. There is definite rigidity of the back muscles and contracture of the hamstrings on flexing the thighs (Kernig's sign). The abdominal reflexes may or may not be present, the knee-jerks are usually accentuated, and the plantar response, if obtained, is always flexor. In a large percentage of this series a rash was also present in the early stages (see below). The first lumbar puncture, with two exceptions, invariably yielded turbid fluid, usually under some pressure, in which meningococci could be demonstrated. If favourable, these cases gradually improved under treatment with yielding of the symptoms usually after four to seven days; recrudescence of symptoms after apparent recovery occurred in three cases that ultimately recovered; but, as a rule, convalescence, when it started, progressed slowly but steadily to recovery. The unfavourable cases either proved fatal at some time during the first fortnight (and usually within the first ten days) during the septicæmic stage of the disease, or else progressed

to chronic meningitis, a condition in which the septicaemic stage seems to be entirely passed and the symptoms are referable to hydrocephalus Three cases reached this chronic stage which is characterized by stupor, progressing to complete [illegible] subnormal temperature, varied by occasional bouts of pyrexia and intermittent vomiting, with pronounced emaciation great rigidity of all muscles and marked head retraction Two of these patients died in this condition, with symptoms of respiratory failure one after four and the other after ten weeks illness The third took an unaccountable turn for the better after seven weeks illness when hope had been practically abandoned and made a very slow but complete recovery With these exceptions all the fatal cases died within three weeks of the onset of the disease while the septicaemic condition was still pronounced Death in these cases appeared to be due to a combination of sepsis and hydrocephalus The temperature respiration and pulse rate as a rule steadily rose for a short time before death often reaching [illegible] respectively the patient became more and more comatose and finally died from respiratory failure At the autopsy purulent exudate would be found around the cord and at the base of the brain extending for a variable distance along the course of the vessels on to the roof of the cerebellum and the vertex and pus was frequently found in the lateral ventricles which were to a greater or less extent dilated In two cases purulent pericarditis was also found and in two others acute bronchitis and broncho-pneumonia but, as a rule, the thoracic and abdominal viscera were normal

In contrast to these cases the post mortem examination of the chronic cases showed the presence of a large quantity of almost clear fluid in the dilated basal cisternae in the subarachnoid space of the cord and in the greatly distended lateral ventricles with large flakes of white lymph adhering to the cord and the base of the brain There was no sign of any acute septic process

Special Features of the Epidemic Complications

(1) The most noticeable feature in this epidemic was the frequency of a rash Sophian observed petechial rashes in only 5 per cent of 185 cases, and a purpuric rash in less than 1 per cent of several hundred cases, and notes that these were always very severe cases In contrast to this sixteen cases out of thirty one of this series presented a definite purpuric rash in the early period of the disease The spots varied in size from petechiae

T

in purpuric blotches the size of a sixpenny piece and appeared on almost every part of the body, including in two cases the conjunctivae. If seen very early the rash was roseolar, but the macules rapidly became haemorrhagic. The cases with blotchy rashes generally died but eight cases out of the whole sixteen recovered. The rash appears at a very early stage usually not later than the second day, rapidly reaches its maximum and rapidly fades.

(2) Joint lesions, on the other hand, which are declared by Sophian to occur in 10 to 15 per cent of cases in some epidemics were very rare. They were only seen in two cases both of which recovered and appeared as a mild synovitis, of one joint in one case and of two in the other with temporary pain and swelling, which disappeared within a few days.

(3) Paralysis of cranial nerves was also very uncommon. In two cases a facial palsy was noticed and in four others a strabismus, all were very transient and never lasted more than twenty-four hours so that it is possible that the lesion may have been missed in other cases. All the patients with strabismus died.

(4) Optic neuritis was not detected in the few cases which were examined.

(5) One patient in the series developed signs and symptoms of broncho-pneumonia. He was an extremely acute case, and died on the fourth day. At the autopsy confluent broncho-pneumonia with a patch of recent pleurisy was found, involving the left posterior lobe.

(6) Deafness occurred in five cases, three of whom died. In one case it was associated with a bilateral aural discharge. This patient subsequently recovered, the discharge stopped, and he regained full hearing.

(7) Conjunctivitis was noted in six cases as an early symptom. In five of these it was a mild muco-purulent infection, of no moment, but in the sixth case it was succeeded by bilateral keratitis, irido-cyclitis, and panophthalmitis. The patient recovered, but is left permanently and completely blind. The case was a somewhat remarkable one and deserves a short description:—

A—— B——, a boy, aged 10, went sick on May 8, complaining of pain in the calves and of sore throat. In the evening his temperature rose to 104·6° F., he had marked rigidity of the neck with some retraction of the head and a definite Kernig's sign and a fine petechial rash appeared on the back and legs. He was admitted to hospital the same evening where these signs were confirmed: his mental state was unaltered. Lumbar puncture was performed

[illegible] clear fluid under [illegible] pressure withdrawn which proved sterile on culture. The following day the rash was more profuse, the spots varying in size from fine petechiae to macules the size of a threepenny piece, and there were small haemorrhages in both conjunctivae. He then complained of no headache, but vomited several times during the day. Lumbar puncture again produced clear fluid. On the 10th his condition was about the same, but he had return of headache with more vomiting, and also complained of pain in the right elbow joint, and had marked conjunctivitis. Lumbar puncture fluid was for the third time clear, but a blood culture taken on this day proved positive, typical meningococci being obtained. On May 11 the lumbar puncture fluid was opalescent. Bilateral keratitis appeared on this day, and the condition rapidly progressed to panophthalmitis. One more joint became swollen and painful, but the other symptoms gradually declined and the patient was convalescent fourteen days after the onset. Unfortunately the opalescent fluid drawn off on the fourth day was mislaid and not examined bacteriologically, and no further opportunity was afforded of finding meningococci in the exudate, but it would appear that this was a case of meningococcaemia with meningitis occurring late in the disease as a subordinate feature.

Diagnosis

When the presence of the epidemic was recognized the diagnosis did not present great difficulty. As a rule, the cases reached hospital within forty-eight hours of their onset, and the later cases frequently not later than twenty-four hours, and there was a definite clinical resemblance between the cases when they were first seen. The diagnosis was always made, as far as possible, upon obvious clinical data, and then confirmed at once by lumbar puncture. Sophian described two stages of the infection. (1) The accumulative stage,' due to invasion of the blood-stream by the organism, is predominantly a bacteriaemia which precedes the meningitis; the cerebro-spinal fluid is increased in quantity owing to irritation of the meninges, but is still quite clear, and, as a rule, does not contain any increased number of cells or any organisms. (2) After an interval of hours, or even days, the stage of definite meningitis follows: it is ushered in with a violent nervous outbreak, and general aggravation of the symptoms. In our experience these two stages are by no means easy to differentiate, and although on looking back on the cases it is often possible to make the

distinction, it is evidently difficult to arrive at a certain diagnosis in the early stage in fact, by the time the cases reached hospital they had all with two exceptions passed into the stage of meningitis proper and the fluid drawn off at the first puncture was definitely turbid The two exceptions were (a) the case of meningococcaemia already described (b) one of the later cases, in which a diagnosis was made confidently on admission, and in which the fluid was clear and sterile on the puncture, but turbid and containing meningococci the next day In this case there was no aggravation of symptoms on the second day, our remarks under this heading refer therefore to diagnosis early in the second stage The following factors appear to be of importance —

(1) *Acute onset* of severe headache, pain in the neck and limbs, and pyrexia with repeated vomiting independent of food occurring in a patient previously in full health

(2) *The mental state* This is a most striking feature and to us the most important In only five cases could it be described as normal when the patient was first seen, these were all subacute cases occurring towards the end of the epidemic In all the other cases the mental state was distinctly abnormal The condition varied very considerably, some patients were drowsy and apathetic, others showed cerebral irritation, lying curled up and resenting all interference and being hypersensitive others were mildly or violently delirious, and in some instances maniacal while yet others were so deeply comatose that they failed to resent lumbar puncture But whatever the change, it was always very definite and therefore of very great diagnostic value

(3) *Severe headache* was manifested by all those patients who were sufficiently rational to answer questions The pain appears to be sometimes more intense in the occipital, sometimes in the frontal region while frequently it is an intense generalized pain felt all through the head

(4) *Rigidity of neck muscles* is of equal importance, and was noticed in every case except two, which were admitted in coma sometimes there was definite head retraction at the onset but usually this, if it occurred, only developed later there was always pain and stiffness in attempting to flex or rotate the head

(5) *Kernig's sign* occurs *pari passu* with rigidity of the neck, and is of similar importance It occurred in every case in which there was rigidity of the neck In one or two of the more acute cases there was a spasticity of all the limb muscles, the patient lying on his side with all his large joints semi-flexed

(6) *Pyrexia* at the onset was invariable.

(7) *Nasopharyngeal catarrh* with sore throat, injection of fauces, and nasal discharge was frequent but only marked in the more acute cases occurring early in the epidemic. Its absence is of no importance in forming a negative diagnosis.

(8) *The tongue* was invariably dry and thickly furred, and the breath foul.

(9) *A rash* when present, was of very great diagnostic value; as mentioned above purpuric rashes occurred in 52 per cent. of the cases and in two of the later cases they were the one important sign on which the diagnosis was made. On the other hand their absence is of no importance.

(10) *Herpes labialis*, usually very pronounced, occurred in 45 per cent. of the cases. It is of some diagnostic importance in conjunction with the other symptoms.

When a diagnosis had been provisionally made upon clinical data it was regularly confirmed by lumbar puncture followed by microscopical examination of the fluid. This is the only certain method of diagnosing the condition from other forms of acute meningitis. The first case alone was not so confirmed, but the clinical features leave so little room for doubt that it has been confidently included in the series. F—— H—— was taken suddenly ill on January 15, with severe headache, pyrexia (102·5° F.), and delirium. On admission to hospital twenty-four hours later he was unconscious, but very violent when roused. There was some muscular rigidity, and herpes labialis; his breathing was irregular, of the Cheyne-Stokes variety. No physical signs of disease were found in the chest or abdomen. The patient was still delirious the next day, but considerably better and steadily improved, but for a fortnight he had severe frontal headache.

With this exception the diagnosis was confirmed in the laboratory in every case.

Differential Diagnosis

During the epidemic a diagnosis of cerebro-spinal fever was provisionally made in six cases which lumbar puncture proved to be mistaken. Three of these subsequently developed signs of pneumonia or broncho-pneumonia. These three cases closely simulated meningitis at their onset, the illness starting abruptly with severe headache, pain in the neck and back, and pyrexia. All of these had rigidity of the neck muscles and pronounced mental change, and one had a definite Kernig sign, while in none

did the [illegible] develop in the chest until the second or third day of the disease. The fluid as withdrawn by lumbar puncture was clear and sterile [illegible] but in two of the three the pressure was [illegible]. These three presented much the same clinical features. Two of them had a pronounced Kernig sign and [illegible] and all had severe headache and pyrexia. [illegible] The headache and pyrexia persisted for several days, but the symptoms gradually subsided and the patients got well without developing signs of any definite disease. It is possible that any or all of the three may have been mild cases of meningitis, which were tapped during the "accumulative stage" before the meningitis developed; there is no proof of this and they must, therefore, be classed as cases of influenza with meningismus.

It is probable that at any other time all these cases would have escaped lumbar puncture. During an epidemic it was natural that the suspicion of meningitis should have arisen, and the symptom complex of severe headache and pyrexia of sudden onset with definite change in the mental state, rigidity of the neck muscles, and Kernig's sign in our opinion warranted at such a time the performance of this slight operation, which is in no way dangerous and is of great importance in establishing a diagnosis.

The other principal conditions which simulate the disease are meningismus occurring in typhoid fever and gastro-enteritis and other forms of meningitis, but examples of them have not come within our experience.

Laboratory Diagnosis

Smears were made from the spinal fluid in every case, and stained by Gram's method. There was considerable variation in the number of organisms found. In some cases many diplococci could be seen in every field under one-twelfth objective both intra- and extra-cellularly. In others a prolonged search was necessary before any organisms were found, but in every positive case some indisputable Gram-negative diplococci were seen. It was found that the number of organisms seen did not form an entirely reliable guide as to the severity of the case. Thus in one case the fluid obtained on the first day contained a very large number of organisms—as many as were ever seen—the majority of which were extra-cellular, yet the patient made a very rapid recovery. On the other hand, in some of the more rapidly fatal cases several fields had to be examined before any organisms could be seen.

The first smears were usually [illegible] from a drop of the fresh fluid if these were negative [illegible] allowed to settle for a few hours and a second [illegible] from the deposit It was not found necessary to centrifuge the fluid before examination

The first attempts at obtaining cultures were not successful owing to an undue appreciation of the lack of resistance of the organism to cold The fluids were collected at the bedside, taken to the laboratory and there inoculated, and in some cases an hour or more elapsed before the cultures were made A change of method was subsequently adopted Culture tubes were taken to the ward and the first few drops of the fluid allowed to run direct from the needle into the tubes which were then incubated at once The results were most satisfactory, and out of nineteen cases so examined only two failed to give positive cultures of the meningococcus One of them was a mild case in which very few organisms could be found in the smear, and the other was admitted on the seventh day of the disease The medium used in every case was freshly made blood agar, which proved very satisfactory Glucose ascitic agar and nasgar were not used owing to the difficulty of obtaining ascitic fluid at the time, two to five drops of the fluid were sufficient to give a readily distinguishable growth Centrifugalization of the fluid before inoculating the tubes was not found necessary and was avoided on account of the dangers of contamination In very mild cases or in cases tapped late in the disease it is probably advisable but in our opinion rapid inoculation is of very much more importance and the concentration of the fluid is then not required The cultures so grown were found to have the very characteristic appearance that is described in text books of bacteriology, and they could be diagnosed from the gross morphology, but they were always confirmed by staining smears by Gram's method

The action of the cultures on glucose, maltose, and saccharose was tested in nine cases eight fermented glucose and maltose but not saccharose the ninth fermented saccharose in addition

A second method of culture was accidentally discovered in the course of the work namely auto culture of the spinal fluid If incubated in a sterile tube while still warm the organism was found in several cases to grow vigorously both inside and outside the cells, and smears made twenty-four to forty eight hours later were found to be thickly crowded with meningococci After forty eight to seventy two hours the organisms rapidly autolyzed and in a smear made at the end of this time no organisms could be

discovered. For some reason that we cannot, at present, state this growth does not always occur, and therefore it would not seem to be a reliable method to employ, but when it is successful the slides obtained are very striking.

With regard to the period of the disease during which the organisms can be cultivated, considerable variation was met with. The first fluid drawn off always contained live organisms. In the cases that rapidly recovered the fluid was found sterile after a few days, but in one case which recovered very slowly a culture was obtained fourteen days after the onset. In the cases that progressed rapidly to death the fluid contained live organisms throughout. In those which passed into the chronic stage, and subsequently died, it became sterile usually after the first week or ten days. The disappearance of the organisms in the fluid cannot, therefore, be taken to mean that the disease is cured.

Blood cultures were taken in three cases in the active stage, and in two proved positive. The latter of these was taken from the case of meningococcæmia already referred to, and was made by inoculating 1½ c.c. of blood from a vein into each of two 9 in. Petri dishes containing peptone agar, thus forming blood-agar plates. Six and seven colonies respectively were found on the plates twenty-four hours later, which on sub-culture proved to be pure colonies of meningococcus.

In all, cultures of the meningococci were obtained from twenty-two out of the thirty-one cases, and the organism was demonstrated in the cerebro-spinal fluid in thirty cases.

Morbid Anatomy

Post-mortem examinations were held on twelve of the fatal cases. The main lesions of the acute and chronic stages of the disease have been described above. No evidence was obtained in any case of infection of the middle ears or of the ethmoidal region. In the last six cases the sphenoidal sinuses were examined, and in four of them the pus was found on either one or both sides. The striking feature of these cases was that the pus was strictly localized to the sphenoidal sinuses, and was not found in the ethmoidal region or the nasal meatuses. The sinuses appeared to be shut off from the nasal cavity. In one case a Gram-negative diplococcus, corresponding in gross and minute morphology and in sugar reactions to the meningococcus, was cultivated from this pus, but it grew at 22° C. and therefore cannot be classified as the meningococcus itself. In this case the bony wall of the sinuses was apparently inflamed,

[illegible] osteomyelitis As [illegible] the results confirm [illegible] of Lambleton and [illegible] infection occurs at any rate in some cases, by [illegible] spread through the lymph channels of the bone into the pituitary fossa and so into the meninges, it is interesting in this connection that Westenhoeffer[2] stated in 1896 that meningitis occurs earliest in the hypophyseal region and that he found 34 per cent of all cases examined had sphenoidal infection.

TREATMENT

(1) Repeated lumbar puncture was practised as a routine treatment In some of the earlier and most severe cases puncture was done as often as twice in twenty-four hours, for the relief of urgent pressure phenomena, but in the majority it was done once a day for the first four or five days, and after that at less frequent intervals according to the symptoms and progress of the patient As much fluid as possible was allowed to run away at each puncture, severe headache occurring during the operation being the only indication for removing the needle before the fluid stopped flowing As much as 70 c c was occasionally withdrawn No untoward symptoms resulted in any case.

(2) Serum treatment Twelve of the first thirteen patients were treated with Burroughs and Wellcome's antimeningococcus serum, four recovered and eight died Three of these patients also received injections of Mulford's serum, when the supply of Burroughs and Wellcome's was exhausted The warmed serum was injected slowly into the spinal canal through a syringe and up to 30 c c was given at a time, severe pain in the head and legs being taken as an indication to stop On one occasion symptoms of cerebral pressure developed during an injection and the patient suddenly stopped breathing The fluid was at once allowed to run out, and atropine was given hypodermically, and the normal respiratory rhythm returned The injections were usually repeated daily during the first three to four days, and after that less frequently according to the symptoms Four cases were treated with Mulford's serum only, of these two recovered and two died

These results were so disappointing, and differed so strikingly from those recorded by Flexner, Robb, Sophian, and other observers, that in the latter half of the epidemic serum treatment was almost abandoned In only one case did a critical fall of temperature follow

[1] Lambleton and Peters Lancet 1915 vol i p 1078.
[2] Westenhoeffer Klin Jahrbuch 1906 xv p 447

an injection with [illegible] improvement in the symptoms This patient F—— C——, a boy, aged 15 was admitted on the second day of his disease Lumbar puncture produced clear fluid The following day the fluid was turbid and the day after that, i e the fourth day of his disease he was given 25 c c of Mulford's serum The temperature fell rapidly from 102° F to 98 F during the next twelve hours and remained steady about the normal line, all the symptoms showing corresponding improvement With this exception no case can be pointed to in which more than temporary improvement followed the injections This lack of success appears to have been experienced by other observers during this epidemic and is perhaps explained by the supposition that the organism was of a different strain to that responsible for the recent American epidemics.

(3) During the latter half of the epidemic soamin was employed in 16 cases, as recommended by G C Low[1] Two of the cases also had a dose of Mulford's serum Of these 16, 10 recovered and [illegible] The drug was given by intramuscular injection into the [illegible] and the dose employed was 5 gr on the first and second day followed by 3 gr a few days later, while in some cases further doses were given at intervals according to the symptoms The largest quantity in all administered to any patient was 27 gr and the average quantity 14 gr No toxic effects were observed The figures as they stand compare favourably with those of serum treatment and suggest that the drug is of some value But it was only used in the latter half of the epidemic, when the severity of the disease had markedly declined and the figures therefore form no criterion of the comparative value of the two methods of treatment No direct improvement in the symptoms was observed following the injections that could not be attributed to the lumbar puncture which was practised at the same time Our opinion is that Burroughs and Wellcome's serum did no harm and that Mulford's serum and soamin did little if any good We relied more upon repeated lumbar puncture than upon any other form of treatment

(4) The usual symptomatic treatment was employed for headache restlessness, and insomnia, which form such marked features of the disease Morphia was only rarely resorted to, as we judged that it has a very depressant effect upon the respiratory centre and bromides and chloral were the sedatives commonly used Urotropine was given in several of the early cases, but seemed to have no effect

[1] Low *Brit Med Journ* 1913 vol i p 378

[illegible]

Of the whole [illegible] cases [illegible] recovered and 16 died, a mortality of 52 per [illegible] gives a grim picture of the virulence of the [illegible] and of the [illegible] inefficacy of treatment but it is [illegible] satisfactory that with one exception, all the patients who survived recovered completely and either have already returned to duty or will shortly do so. The exception was the case already referred to in which eye complications led to complete blindness. No other residual symptoms have been observed and convalescence, although often prolonged, has been complete without either relapse or permanent disability of any kind.

The severity of the epidemic decreased markedly in the later stages. This was evident from a study of the intensity of the symptoms and can be judged from the fact that out of the first 17 cases, 6 recovered and 11 died while out of the last 16 cases 9 recovered and only 7 died.

We are greatly indebted to Dr. H. D. Rolleston, for his constant assistance in the treatment of the cases and for his advice in the preparation of this paper and to Staff Surgeon J. S. Dudding for his help in the bacteriological work.

[illegible] SIMPLE AND SAFE SOMNOFORM OR ETHYL CHLORIDE INHALER FOR MINOR OPERATIONS

By [illegible] W. BERNALDO[illegible], M.D., B.S., M.R.C.S., L.R.C.P.
[illegible] Hospital, [illegible] Melbourne
[illegible]

In [illegible] this inhaler to the [illegible] of the profession in the [illegible] with the feeling that it will supply a long-felt want, [illegible] simple method of anæsthesia for those minor opera [illegible] to three minutes duration—such as the opening of an abscess, scraping out of a sinus, extraction of teeth, removal of post-nasal growths, tonsillotomy, &c.

The following illustrations assist in describing the apparatus and method.

The inhaler in use was made for me by Gardner of Edinburgh, and is different from that with which the majority of my work was done in that the rubber bag is now made with a wide opening, so that the bag can be easily turned inside out for cleansing purposes. It also permits of the rubber being vulcanized on both sides, and so prevents the corroding action of the ethyl chloride, which was found to destroy the bag and make it leaky after some months' use. The alteration of the bag was the outcome of a suggestion by Mr Perritt, the dental surgeon and anæsthetist at the Melbourne Dental Hospital, and is a distinct gain.

Both ethyl chloride and somnoform have been used for some years as general anæsthetics, and there have been several cases of fatalities occurring under the administration of ethyl chloride. These fatalities have occurred, however, when ethyl chloride has been administered in a closed inhaler. Somnoform, which, under its more recent formula, consists of 83 per cent. ethyl chloride and also a small percentage of methyl bromide and ethyl bromide, is found to be less depressing than the pure ethyl chloride.

Ethyl chloride administered with a certain percentage of air, and in which the strength of the ethyl chloride vapour is gradually increased, is far less depressing than in those cases in which it is administered in the absolutely closed inhaler.

In the one case, that of the closed inhaler, the patient receives a concentrated dose of a very powerful anæsthetic, and this may lead to cardiac inhibition. In the case of the absolutely open method of ethyl chloride administration, or in that of the semi-open method as advocated by the use of the inhaler under notice, the

somnoform, or ethyl chloride, is brought more gradually in contact with the patient A man may receive a direct sharp blow over the heart and that blow may kill him by cardiac inhibition, or he may

[illegible] A [illegible] B [illegible] C [illegible] D [illegible] E [illegible]

[illegible] A Face p[illegible] B for [illegible] somnoform [illegible]

receive a powerful push over the heart that may cause him no trouble whatever – the same arm delivering [illegible] blow, but in the one case death may ensue in the other it does not. Or again a man

[illegible] walks down to catch his train every morning, [illegible] his time and never hurries himself, with the result that [illegible] happens [illegible] one morning his watch is a bit out, and he [illegible] rush for the last hundred yards or so; before the train [illegible] the next station he has collapsed and is dead—he has just [illegible] that little extra strain on the heart that it could not stand. [illegible] same applies to ethyl chloride administration—in the case of [illegible] closed method the patient is knocked into a stage of unconsciousness, in the other he is pushed into it. In the latter [illegible] less strain is thrown on the heart.

[illegible]

[illegible] *[illegible] thetist* [illegible] than ethyl chloride. I [illegible] speaking now of those cases in which either somnoform or ethyl chloride are used in a closed inhaler. By the open method, that is by the open drop method of administering ethyl chloride, this drug is, I think, quite as safe as somnoform; in fact, during the past five or six years at the Melbourne Dental Hospital open ethyl chloride by the drop method is always given to young children or delicate patients. The average number of general anæsthetics administered at the Melbourne Dental Hospital is close on [illegible] per annum; in the last return, which is about twelve months old, over 21,000 general anæsthetics have been administered in seven and a half years. Of this number nearly 19,000 were either ethyl

[illegible] admin[illegible] has been no death [illegible] either during [illegible] following [illegible].

At this hospital nitrous oxide [illegible] partially abandoned as an anæsthetic as both [illegible], especially if

[illegible]

used in conjunction with oxygen and al[illegible] is no safer th[illegible] open somnoform or ethyl chloride. The anæsthetic is given with the patient sitting upright in the dental chair and in the large majority of cases by dental students. In the Melbourne [illegible] Ear Hospital open ethyl chloride by the drop method is used

entirely for all [illegible] tonsillotomy cases [illegible] abandoned.

Though I have [illegible] strongly in favour of open [illegible] open administration [illegible] ethyl chloride and somnoform it must be distinctly understood that I am strongly opposed to the closed method of ethyl chloride administration. If an administrator must

Fig. [illegible]

use a closed method, which personally I think quite unjustifiable and unnecessary, then he should use somnoform in preference to pure ethyl chloride. Somnoform is not quite as pleasant a drug to take as pure ethyl chloride but it is far from being unpleasant if properly administered. I would strongly advise any anaesthetist to try the drug on himself, viz. to take the semi-open inhaler,

squirt into it [illegible] ethyl chloride—he can do this sitting quite comfortably in an armchair—and then to gradually close over the air-valve. He will then experience what a difference there is between closing the air-valve gradually and closing it suddenly. In one case the sensation is not unpleasant, in fact

[illegible] completion [illegible] minutes later [illegible] complete [illegible] breathes with [illegible] anesthesia

almost as pleasant as nitrous oxide and oxygen. There is, however, slightly more taste about somnoform.

I always believe in encouraging a student to take an anesthetic before he is permitted to administer one, for the first time. I am now speaking especially of somnoform or ethyl chloride. He will then learn how uncomfortable it is if the anesthetic is rushed on

the patient. The administrator should take from three quarters to one minute to close over the air valve, but even then it is far better to leave the valve open to a very small extent, viz., about $\frac{1}{16}$ inch. The air-valve has a diameter of about $\frac{1}{2}$ inch, and when administering I generally close over the first third of the air

[illegible] administration, commencing to [illegible] ethyl chloride [illegible] moderate or [illegible]

valve directly after applying the apparatus, the other two thirds [illegible] much more slowly, and if there is any sign of [illegible] it is immediately opened up again. Laryngeal [illegible] general rule means that the anæsthetist is rushing [illegible]

[illegible] the reader may have an idea of the quantities of

[illegible] anæsthetic [illegible] required for this very simple open method the following notes are given —

February 23, 1915 H M A S "Australia" Time 2 10 p m Heavy snow on ground Temperature of operating theatre 54° Patient, aged 25 strong, athletic stoker, moderate smoker, not teetotaller Patient given $\frac{1}{6}$ gr morphia and $\frac{1}{150}$ gr atropine at 1 p.m This custom of giving the *small* dose of morphia and atropine about three quarters to one hour before operation is almost universal throughout Australia and applies especially to the big hospitals in Victoria I never recommend a larger dose than $\frac{1}{6}$ gr

[illegible]

morphia and [illegible] atropine [illegible] sufficient for anyone [illegible] at the [illegible] safety of administering an anæsthetic [illegible] operations of very short duration in which [illegible] is the anæsthetic used The doses recommended are —

3½ years— 8 years	[illegible] gr morphia and [illegible] atropine
8 years—12 years	[illegible] gr morphia and [illegible] atropine
12 years to any age	$\frac{1}{6}$ gr morphia and [illegible] atropine

and use the *tablets* not made up solution

The p[illegible] contra-indicate the use of the [illegible]

Operation Circumcision Administration of anæsthetic *commenced at 2 13 p m* Anæsthetic used ethyl chloride drop method followed by chloroform ($CHCl_3$) and ethyl chloride work well together, in fact Burroughs and Wellcome's chloroform contains

FIG 7.—The Murray's mask [illegible] Head and shoulders raised at [illegible] table

a small percentage of ethyl chloride to improve it, and then followed by open ether on Murray's mask of one layer of flannel Patient fully anæsthetized and ready for operation at 2 16 p m or three minutes from start of anæsthetic administration Prepuce cut with scissors at 2 18 p m Patient gave no trouble going under *Head and shoulders were kept raised during induction and throughout operation at angle of 40°.* A patient will take an anæsthetic far

[illegible] with the head and shoulders [illegible] [illegible] [illegible] [illegible] head and shoulders [illegible] [illegible] the most comfortable. The old [illegible] not only very uncomfortable for the [illegible] has only to have tried

[illegible] Murray's mask in position [illegible] [illegible] so that no air [illegible] [illegible] will not then fall back or [illegible]

on himself to find out—*but was also not the best of position* for administering an anesthetic. The man who maintains a moderate elevation of his patient's head and shoulders when administering an anesthetic has something to fall back upon should his patient collapse. He will also be able to maintain an even anesthesia with less anesthetic than the man who is working on a patient with a

highly congested brain and engorged neck as is the case in the head low position

Operation took nineteen minutes Anesthetics used —

Ethyl chloride	5 c c
Chloroform	½ dr during induction
Ether	1¼ ounces

Fig 9 —Murray's mask [illegible] concentrating towel [illegible] that ether vapour is more [illegible] would [illegible] With the concentrating [illegible] the mask [illegible] so that the patient's [illegible] normal [illegible] There should [illegible] more ether to the mask [illegible] but not in the towel The [illegible] expert the administrator the less [illegible] concentrating towel over the mask

Anesthetic stopped at 2 30 p m, just before completion of suturing, patient rousing at 2 3[illegible] p m Eyes were kept well bandaged and *shut off from all light* throughout operation, bandages not being removed until completion of suturing The shutting

off of all light from the eyes when the patient was anæsthetized is a great gain It lessens the quantity of anæsthetic required to keep the patient under, especially in those cases which have had morphia and atropine before operation It enables the surgeon to carry out a severe operation such as the removal of a breast and clearing out the axilla with the consumption of a minimum amount of anæsthetic, which is a distinct gain to the patient and favours a more rapid convalescence

Personally, I never see my patients eyes when once under an anæsthetic, but watch carefully the breathing and read the circulation by pinching the lobe of one ear

Patient began to retch when emerging from anæsthetic but on raising head and shoulders to an angle of about 70 retching stopped No post-operative vomiting This stopping of post-anæsthetic vomiting by raising the head end to extreme elevation has been noticed by many observers and *post-operative vomiting can very often be stopped by placing the patient in the Fowler position after returning from the operating theatre*

In no instance do I permit my patients to be placed back in bed after operation with the head low The head and shoulders are always kept raised about 4 inches above the level of the bed in many cases the head end of the bed is raised up on blocks about 10 inches high The almost entire absence of post-operative vomiting is largely due, in my own opinion to this custom and also to the fact that every means possible is taken to lessen the amount of anæsthetic consumed by the patient such as the preliminary injection of morphia and atropine, moderate elevation of head and shoulders, and bandaging the eyes when patient is under

Morphia in some rare instances has a tendency to increase post operative vomiting but this is very rare indeed with the *small* dose of morphia advocated I do not ever remember seeing it in a male case, though two or three instances in anæmic females have come under my own observation

In cases of *extreme shock requiring immediate operation* $\frac{1}{4}$ gr morphia and $\frac{1}{150}$ gr atropine *given within ten minutes* of commencing the administration of an anæsthetic, is a distinct advantage, the anæsthetic being given during the stimulating stage of morphia Morphia, like alcohol is stimulating, sedative, depressant, according to the time when given and the dose

I am deeply indebted to Professor A. Robinson of Edinburgh University, for the facilities he gave me so that the photographs illustrating this article might be successfully obtained

PAINT POISONING.

By [illegible] A. BANKART, C.V.O., M.B., K.H.P., D.P.H., [illegible]

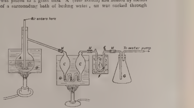
During 1912 and 1913 I made a large number of experiments to try to ascertain whether volatile lead compounds are formed during the drying of lead paints. The experiments were performed as follows: Different kinds of paints with varying amounts of turpentine and oils were employed—air was blown through (1) a box (closed) the interior of which had just been coated with the paint to be tested, and this air then passed into a vessel containing a solution of potassium sulphide (or sulphuretted hydrogen water) which was used as a detector, the black sulphide of lead to be formed acting as an index of the presence of lead. (2) Air was also blown by means of an electric bellows through lead paints and 'flatting' and then on into the sulphide solution. The process was kept up for many hours but with negative results. I thought it possible that this negative result might be due to the formation of volatile compounds of lead and turpentine, &c., which were perhaps insoluble in water. I therefore proceeded to pass the paint emanation laden air through nitric acid for many hours, and then tested the acid for the presence of lead without success—no trace of lead was detected. In one or two of my earliest experiments I detected a very slight discoloration of the sulphide solution which made me think that a trace of lead must be present, but this may have been due to priming or some error in technique, for on repeating the experiments many times I almost always obtained the same negative results. These experiments, although carefully carried out, were somewhat rough, and I was anxious to improve upon them.

For want of room and apparatus on board I was unable to carry out a more elaborate experiment to support the conclusions at which I had arrived, so I asked Dr. Arnold Philip (Admiralty Chemist) to help me. I prepared a sample of turpentine by filtering white lead 'flatting' through a Berkefeld filter candle, using an air pump to force the fluid through the filter; this filtrate was collected and constituted the sample for examination; suitable apparatus was got together, and I was to have been present when the experiment was carried out, but this not being possible Dr. Philip sent me the details of the investigation which I give below. The result of this test confirmed the opinion already formed that no appreciable amount of lead is present in a volatile form when lead paint is dried in the atmosphere.

Dr Arnold Philip wrote as follows —

'The final tests upon the sample of turpentine which you sent me for examination for the presence of lead have only recently been completed, and the results of my tests show that it contains no trace of a volatile lead compound

' The tests which I have carried out on this turpentine sample are as follows The sample as received weighed 25 35 grm, and was placed in a glass flask A (*vide* sketch) and heated by means of a surrounding bath of boiling water, air was sucked through



Sketch of apparatus used in testing for presence of volatile lead compounds in turpentine which had been intimately mixed with white lead A Wurtz distillation flask with side tube B Water bath at temperature of 212° F C, Mohr's absorption bulbs containing strong nitric acid D Water bath at temperature of about 120° F E Glass U tube F Jacket of mixture of ice and salt surrounding U tube G Guard flask no condensation took place in this The water suction pump is not shown H Vulcanized rubber tube joints This rubber is black rubber and contains no mineral matter and no trace of lead

this heated turpentine by means of a water pump at the rate of about 3 8 litres per hour and this air carrying the vapour of the turpentine with it was passed through Mohr's absorption bulbs 'C' containing concentrated nitric acid which was maintained at a temperature of about 120° F by a surrounding hot water bath D The gas, after passing through the heated nitric acid consisting of air nitric acid vapour and turpentine oxidation products, was next passed through U tube 'E,' which was cooled to a low

temperature by means of a surrounding bath of ice and salt [illegible] Here the condensation of all vapours capable of condensation at this low temperature took place. The stream of air was a slow one (about 3 bubbles per second) and at the end of ninety minutes only 31 grm of the hot turpentine had been volatilized, that is rather over 12 per cent of the weight of turpentine originally taken

"It was considered that if any volatile lead compound existed in the turpentine which was capable of passing into the air by evaporation at ordinary atmospheric temperatures, it must have been volatilized into the air stream in this first 12 per cent of the turpentine But when these products are passed through strong hot nitric acid it is to be anticipated that they will be oxidized and the lead dissolved whilst any lead compound or other volatilized turpentine products whether acted upon or not by the hot nitric acid and which were not retained in the nitric acid would all be condensed in passing slowly through the tube cooled to about [illegible], by an ice and salt mixture

"Hence if any lead had volatilized from the turpentine, it was to be found in either the nitric acid contained in the Mohr's absorption bulbs or condensed in the low temperature 'U' tube or in both

The contents both of the bulbs 'C' and the U tube 'E' were therefore transferred to a platinum basin, and with the necessary washings were evaporated down to dryness on the water bath The dry residue thus obtained was treated with a further quantity of strong fuming nitric acid and again evaporated to dryness

'This evaporation to dryness with fuming nitric acid was repeated three times, and was intended to secure that any organic matter present should be oxidized as far as possible After the completion of this thrice repeated operation the final residue was gently ignited to a carbonaceous mass at the lowest possible temperature and the residue and dish was treated with acetic acid to extract lead from the carbonaceous residue

The acetic acid was next filtered off from carbon and tested for lead by the addition of freshly prepared sulphuretted hydrogen water No trace of darkening in colour of the solution was observed, thus demonstrating the absence of lead in this solution

The carbonaceous residue on the filter was then gently ignited until the carbon was all combusted in the platinum basin, and the basin and any residue was treated with acetic acid, water added and the solution tested with SH_2 water Again no darkening

of colour was visible and it is therefore concluded that no volatile lead compound was evolved from the turpentine by a stream of air passing through it at 212° F

[NOTE.—Before this experiment was carried out the filtrate used was examined for lead, and a very small percentage of lead detected, viz, ·0014 per cent on 25·5 grm taken]

The experiment was carried out by evaporation of the turpentine at 212° F and my own experiments at ordinary room temperature it was therefore thought advisable to repeat the experiments at ordinary room temperature, for otherwise an objection might be raised that although the experiments may be held to demonstrate that volatile turpentine compounds containing lead are not given off into the air at 212° F, yet they may be given off at ordinary temperature because it may be argued that air at 212° F causes oxidation of the alleged volatile lead turpentine compound, and that its volatility may thus be destroyed

The experiment was therefore performed again at ordinary room temperature using a similar filtrate The following conclusions were drawn from the results of the two experiments —

(1) "When the turpentine containing the liquid lead compound is distilled at 212° F in a stream of air the lead compound is either destroyed by oxidation or is rendered non volatile In any case it does not evaporate

(2) "The liquid lead turpentine compound is volatile in air *at ordinary temperature* and is present in the vapour formed to the extent of 7 to 14·7 parts of lead by weight per every 100,000 parts by weight of the vapour evaporated from the original turpentine filtrate"

It seems improbable from a practical point of view that 7 to 14·7 parts of lead per 100,000 parts of turpentine vapour in the air of recently painted compartments could cause symptoms of lead poisoning, for the amount of lead absorbed into the system by a stay of some hours in a space containing a considerable percentage of the vapour could not possibly exceed the amount of lead in say a couple of doses of pil plumbi cum opio, or a medicinal dose of lead acetate

The results arrived at by these experiments are in the main similar to those obtained by leading authorities on this subject viz, Baly, Armstrong and Klein in England and Breton in France

I believe that lately Sir Thomas Oliver of Durham, by means of the spectroscope, and Professor Baly of Liverpool by experiments on animals, have come to the conclusion that the

emanations from lead paints contain no appreciable quantity of lead and that the former is inclined to consider carbon monoxide as the final oxidation products which cause the symptoms of "paint poisoning," whereas Professor Baly suggests that aldehydes cause the mischief.

I was unaware that experiments were being carried on with regard to this subject by Messrs. Moore, Oldershaw and Williams, at Liverpool, but having lately read their paper I find that by their experiments on animals the absence of lead in emanations from lead paints appears to be undoubtedly confirmed. I had often suspected that some symptoms of so-called lead poisoning were not necessarily due to lead but to other substances in the paints than the metal itself, e.g., turpentine and its substitutes—in the form of various kinds of thinners and driers. The general opinion regarding the emanations from lead painted surfaces has been that those exposed to such emanations were liable to symptoms of *true* lead poisoning. This now seems more than doubtful. I note Oliver, in his work on "Lead Poisoning" (Lecture III), says: "As regards the entrance of lead by the respiratory organs, there is no doubt that people who have slept a few nights in newly painted rooms have suffered from colic. Colic has been experienced by naval officers whose sleeping cabins have been recently painted. To this circumstance, lead dissolved in a volatile agent, such as turpentine, was attributed part of the colic sèche met with on board French men-of-war." Now the true colic sèche is undoubtedly due to lead, but I think it much more likely that some cases of so-called lead colic and diarrhoea are due to the oxidation products of turpentine, or turpentine substitutes, and that the cases of respiratory lead poisoning proper are due to lead dust passing via the mouth and nose, and so becoming absorbed into the system via the respiratory mucous membrane, or being swallowed and absorbed through the stomach. Saito—a Japanese investigator—has demonstrated experimentally that even when lead is inhaled it enters the body mostly by the gastro-intestinal tract. On the other hand, that fine particles of dust reach the lungs is now generally admitted, and that lead dust is capable of being absorbed by the lung is now regarded as certain. Legge and Goadby, in their book on "Lead Poisoning and Lead Absorption," write as follows:—

"It has been supposed by some that surfaces painted with lead give off certain emanations containing the metal lead as an organic compound. As the incidence of lead poisoning amongst painters is very high it would seem that the painter is peculiarly exposed to

infection by lead dust, and if in addition organic compounds of lead were given off he would be still more liable to lead poisoning"

Experiments were made by Legge and Goadby as follows (1) Animals were exposed in a cage, the boards of which had been freshly painted with special paints white lead, lead sulphate zinc sulphide, zinc oxide The result showed that animals confined in the cage and exposed to freshly painted surfaces soon showed signs of poisoning becoming emaciated, and suffering from recurrent attacks of salivation Animals exposed in cages in which air was passed over lead sulphate *paste*, or white lead *paste* showed no signs of illness although kept in the cage and subjected to the inhalation of any fumes which might be given off for three months Now by this experiment it seemed clear that whatever illness was produced in the animals exposed to fresh paint they were *not* suffering from the absorption of lead but of some other compound of which the paints were made Various constituents of paints were therefore, tried namely the metallic bases lead or zinc, and linseed oil, with turpentine with lead acetate mixed with turpentine The animal exposed to the turpentine alone very rapidly showed signs of disease, salivation, a tendency to diarrhoea strabismus whilst the quantity of turpentine present in the cage air did not exceed 10 mg per litre The animal exposed to turpentine and lead acetate exhibited few symptoms but the same in kind as the animal exposed to turpentine alone. The linseed oil animal showed no signs of disease whatever The animals exposed to the metallic bases of the paint, white lead, &c , showed no signs of poisoning as long as the compound itself was not thrown into the air in the form of dust but when dust was present in the air the animal rapidly showed signs of lead poisoning Lehmann describes symptoms produced in cats when exposed to the vapour of turpentine (*Archiv fur Hygiene* 1899) Similar symptoms were found by Legge and Goadby They state that pathological examination showed definite disease of the kidney tubular nephritis heart muscle flabby, and heart tending to dilation, and microscopical hæmorrhages throughout the muscle of the organ No changes of any sort were found in the tissues of the animals exposed to the emanations given off from white lead *paste* By analysis these emanations were found to contain *no lead*, but traces of aldehyde, formic acid and CO_2

It follows, therefore, that the effect of turpentine, when inhaled by the painter must be to act as a contributory cause of lead poisoning, and it is interesting to recall the fact that Garrod has described gout as occurring constantly among painters Gout is *not*

common among workers in lead fac[illegible] where the exposure to lead is very much greater than among painters, and this fact points to turpentine, &c., as the cause of the increased incidence of gout among house painters, and not lead absorption. The importance of dust containing lead as a source of lead poisoning in painters must not be minimized, as in sand papering, pumice stoning, &c. The importance of lead inhaled in this way is perfectly understood. It is, however, highly probable that the combined action of the turpentine with the lead accounts for some of the early symptoms of so-called lead poisoning. Headache may be mentioned as an early symptom of the disease in painters, but this is not so among white lead workers. Other experiments have been made regarding paint emanations by Balz. He showed that these emanations are aldehydic in character. The condensed emanation from prolonged aspiration over surfaces freshly painted with mixtures of white lead and oil did not produce lethal or even toxic results when subcutaneously injected into an animal, but had a nauseating odour, and in case of the experimenter himself, inhalation of this appeared to produce headache, nausea and diarrhoea. It would appear, however, that to produce these symptoms in man the vapour must be concentrated.

With reference to the vapour given off by turpentine or similar volatile dryers, Armstrong, in a recent paper, shows by a simple [illegible], namely the blackening of the leaf of the *Aucuba japonica*, or spotted Japanese laurel, that such volatile vapours come off from mixtures of lead pigment and oil only, or from those with turpentine more readily, or from turpentine alone. He explains the reaction as follows. The volatile bodies enter the stomata of the leaf and activate an enzyme which hydrolyses a glucoside present in this plant, setting free thereby a black substance which acts as an indicator. I repeated this experiment, not only with various paints and flattings composed of lead and zinc with turpentine and turpentine substitutes, but also with the following substances which were volatilized, and the leaves of the *Aucuba japonica* exposed to the oxidized products for a given time. The number of stars denotes the degree to which the leaves were affected by the oxidation of that substance. This experiment was performed at ordinary room temperature (about 60° F.), and there was no artificial addition of moisture made to the air used: methyl alcohol ***, ethyl alcohol ***, Russian turpentine ***, American turpentine **, pure oil of turpentine (medicinal) **, turpentine substitute (as used in Service) **, paraffin *, cam-

phol *, carbolic acid *, formalin **, ether (ethyl) **, chloroform **, paraldehyde **, benzene **, ligroin (petroleum ether) **, formic acid **, acetic acid **, linseed oil mixed with paint *, lead flatting ***, ordinary lead paint **, zinc flatting ***, hydrogen peroxide ***

The leaf was suspended in a glass cylinder, closed above by a piece of india-rubber through which a glass tube passed This tube was connected to another vessel containing some of the fluid to be volatilized and this vessel in turn was connected to an electric bellows Air was pumped through the fluid and then passed on into the glass cylinder containing the suspended leaf Another method employed was to attach a leaf to the top of the inside of a bell jar and to place the bell jar over a Petri dish full of the fluid to be tested, all the substances mentioned gave a reaction in greater or lesser degree, and always being greater as the temperature was raised and amount of moisture in the vessel increased

The determination of the exact chemical composition of the air oxidation products of such complex bodies as terpenes and turpentine is a very difficult matter, as will be gathered from the notes kindly sent me by Dr Arnold Philip in answer to some questions put to him by me on this subject

The Oxidation Products of Turpentine

"Turpentine consists of a solution of various solids called resins in a liquid called 'oil of turpentine, and on dissolving crude turpentine in a current of steam the essential oil passes over, leaving a residue of resin behind

"Oil of turpentine thus obtained is a colourless mobile liquid of specific gravity about 0 86, boiling at about 156° to 160° F. On exposure to moist air, oil of turpentine gradually changes, it darkens in colour, becomes more viscous, and is converted into resin and a variety of oxidation products This is especially the case if turpentine oil is allowed to stand in open vessels and the change is even more rapid if water is present Besides the oil becoming more viscid the specific gravity also increases, and the boiling point rises The solubility in 90 per cent alcohol increases, the original neutral oil becomes acid, resinifies, and becomes what is technically designated as 'rancid Formerly such an oil was termed 'ozonized' because it acted like a strong oxidising agent

"Most of these changes are referable to a slow oxidation caused by the oxygen in the air Schoenbein had assumed that in this process the oil was charged with ozone, the oxygen of the air being

activated by the turpentine oil It was shown later, however, by Kingzett, Bardsky and Papasogli, that the turpentine oil contained no ozone, but hydrogen peroxide. According to Kingzett the ultimate products of the slow oxidation of turpentine oil, camphoric acid and hydrogen peroxide did not result directly Peroxide of camphor $C_{10}H_{14}O_4$ is first formed, which in the presence of water breaks up into camphoric acid and hydrogen peroxide —

$$\underset{\text{Camphor peroxide}}{C_{10}H_{14}O_4} + \underset{\text{Water}}{2H_2O} = \underset{\text{Hydrogen peroxide}}{H_2O_2} + \underset{\text{Camphoric acid}}{C_{10}H_{16}O_4}$$

"Kingzett however, did not succeed in isolating this hypothetical camphor peroxide According to Papasogli the water which has stood in contact with the turpentine for a longer period contains hydrogen peroxide, camphoric acid, formic acid acetic acid, and an acid $C_{10}H_{16}O_2$ isomeric with campholenic acid The oxidized oil is said to contain oxysilvinic acid

"The accuracy of these investigations has been questioned by no one, and the presence of hydrogen peroxide in oxidized turpentine oil can be definitely assumed Nevertheless many text books contain the statement that old turpentine oil in fact oils in general, contain ozone Inasmuch however as ozone and hydrogen peroxide decompose each other according to the following equation

$$O_3 + H_2O_2 = H_2O + 2O_2,$$

the presence of ozone is necessarily excluded

"It has therefore been shown that turpentine oil which has been oxidized in the presence of moisture contains other substances besides hydrogen peroxide This has been attributed to the presence of organic peroxides, which decompose with water so far as ultimately to yield hydrogen peroxide Presumably, peroxide hydrates are formed as intermediate products

"These investigators demonstrate that when absolutely dry turpentine oil is activated, and neither hydrogen peroxide nor ozone result Turpentine oil whether moist or dry, when charged with oxygen, has a capacity to convey the oxygen to such substances as are not directly oxidizable with atmospheric oxygen It is said that activated turpentine oil retains its properties for years if kept in the dark, but little is as yet known concerning the oxidation products resulting

"The presence of the following substances has been definitely ascertained —

[illegible] ($C_{10}H_{16}O_4$) [illegible] composition to [illegible] The latter possess [illegible] the peculiar odour [illegible] possesses accomp[illegible] when warm [illegible]

The principal [illegible] compound [illegible] having the [illegible] formula $C_{10}H_{16}$ [illegible] products [illegible] of the [illegible] Among these may be [illegible] acid and [illegible] products [illegible] terebic acid.

From [illegible] experiments with the *lead* [illegible] and the effect of the oxidation products of the [illegible] upon the [illegible] of the [illegible] "thinners" of paints, e.g. turpentine [illegible] drying products have much the same [illegible] point of view, and that it is only [illegible] analyzed in the air and [illegible] products [illegible] hydrogen peroxide. [illegible] on blood [illegible] poisoning although not lead poisoning [illegible] paints and flattings are being used [illegible] ventilation is bad and the [illegible] in the [illegible] exhibited symptoms of lead [illegible] [illegible] turpentine and [illegible] and flattings now used in His Majesty's [illegible] up with turpentine substitute which [illegible] a light mineral oil. Dr [illegible] made from petroleum fractions of low boiling point, light [illegible] oils, turpentine oil, &c. are all to be regarded as inju[illegible] health.

The precautions taken with regard to painters both [illegible] and allow [illegible] to be based upon the supposition that [illegible] are liable to *lead poisoning* when they work with lead paints and flattings in confined and ill-ventilated spaces, but it has been found that acute symptoms are sometimes produced [illegible] when zinc flatting has been employed and doubtless if [illegible] base were present the same symptoms would have manifested themselves. These symptoms as before mentioned, are really [illegible]

[illegible]

[illegible] painting, after painting, [illegible] may suffer from these [illegible] [illegible]ation is that a painter [illegible] such as washing his hands [illegible] overall which can be [illegible] against "*lead poisoning* [illegible] sand papering or burning [illegible] precautions such as the use of [illegible] symptoms of "*paint* [illegible] oxidized products produced [illegible] though no lead has entered [illegible] probably in direct ratio as the [illegible] For instance surfaces [illegible] substitute (chiefly [illegible] in the Service dry more [illegible] turpentine This may be an [illegible] compounds are produced at [illegible] At the same time it must not [illegible] show that individuals who [illegible] paint poisoning are more sus[illegible] [illegible] they absorb the metal in [illegible] liability to lead poison[illegible] [illegible] change in the tissues [illegible] As an illustration of a recent [illegible] the following:—

[illegible] doctor ashore concerning [illegible] had recently taken a [illegible] to paint his rooms [illegible] He was careful about wash[illegible] [illegible] lead poisoning, such as [illegible] He suffered from saliva[illegible] [illegible] eczema of the face [illegible] in the urine This [illegible] to my mind [illegible] by the oxidation products of the [illegible] I advised that he should stop [illegible] and [illegible] possible all symptoms except the eczema [illegible]

I am aware that [illegible] workers have carried out experiments to prove or disprove the presence of a volatile lead compound, when

lead paints are in process of drying. My object [illegible] has been to [illegible] their results [illegible] notes for our Journal [illegible] attention to the [illegible] I have called "paint poisoning" as opposed to [illegible] lead poisoning occurring among [illegible] in the Royal Navy. I [illegible] to the [illegible] lead poisoning [illegible] be taken to avoid "paint poisoning" when [illegible] painted with [illegible] paints by arranging for [illegible] and [illegible] the temperature [illegible] ventilation of the [illegible] by air pumped through a hose.

I should like to record my great indebtedness to Dr. Arnold Philip for his very generous assistance.

[illegible] EPIDEMIC OF INFLUENZA IN THE ISLAND OF ST KILDA

[illegible] SURGEON R. W. [illegible] HALE [illegible]

[illegible] on Friday June 20 1913 [illegible] Admiral [illegible] commanding the Fourth Battle Squadron then at [illegible] the island of Arran, to dispatch immediately a cruiser [illegible] Kilda for the relief of the inhabitants, who were reported to [illegible] from "an epidemic of influenza and pneumonia, and [illegible] urgent need of assistance.

[illegible] telegraphic communication between St Kilda and [illegible] and the news of the condition of the inhabitants had [illegible] the captain of a fishing vessel which had happened [illegible] H.M.S. "Active" was ordered to raise steam [illegible] full speed and proceed as soon as possible.

[illegible] to the Sailing Directions for the coast of Scotland [illegible] population of St Kilda to be seventy-nine, and although [illegible] the Royal Navy is a floating community complete in all [illegible] the task of dealing with so large a number of acute cases [illegible] calculated to exhaust rapidly the medical stores of a small [illegible] An extra stock of drugs and medical comforts in the form [illegible] food, tinned soups, &c., was therefore drawn [illegible] the other ships of the squadron and three additional [illegible] berth [illegible] wards were also requisitioned. At 7 a.m. on Saturday the 21st the ship left harbour and proceeded at full speed, 25 knots, to her destination.

St Kilda is situated in the Atlantic and is the most westerly of the group of islands known as the Outer Hebrides, the nearest populated district being North Uist, 35 miles to the eastward, while the nearest port on the mainland is Tobermory, 115 miles away.

The island is very small—about 3 miles in length by $1\frac{1}{2}$ miles at its greatest breadth. It is composed of a series of precipitous cliffs, the highest being 1,300 ft., rising sheer up from the sea, except at one point at the south-east where the land slopes down to the shore and provides the only landing place. It is on this slope that the village is situated.

The village consists of a row of seventeen cottages, a church, a building called the post office, and the manse, the house in which lives the Government schoolmaster who also acts as missioner. The cottages, with one exception, are all built on the same

place. The [illegible] one with tarred felt roofs [illegible] rooms [illegible] 12 [illegible] and a third smaller [illegible] 8 by [illegible] which is used in some cases as an additional sleeping place. Of the two rooms one is used as a kitchen and general living space, the other as bedroom and parlour. The floors are of concrete or boarded and all the cottages are quite dry. Each living room has one small window and one fireplace. Sanitation does not exist, the inhabitants defæcate where they wish and refuse is thrown out around the cottages and is scavenged more or less by a horde of mongrel collies. The water supply is from small streams from the mountain, is plentiful, and before it reaches the village at any rate quite clean. Until recently the inhabitants used for lighting purposes fulmar oil obtained by them from the fulmar petrel. Now however paraffin sent from the mainland is used. Peat is the only fuel.

Such is the exposed position of the island that for eight or nine months in the year—September to June—there is no communication possible with the outside world. Even in the summer months the Atlantic swell is at times so great that landing is impossible. A very small portion of the ground is under cultivation and there is not a tree or shrub in the island, nor is there evidence of any attempt on the part of the inhabitants to cultivate flowers in or around the cottages.

The population remains fairly constant, illness is very rare, and crime stated to be unknown. I was informed that the idea prevalent that there is a fairly high percentage of illegitimate births is absolutely incorrect, only one such birth having occurred in the last twenty-five years.

Since all the inhabitants are natives, except the schoolmaster who is from the mainland and one woman, who came recently from another island, it follows that they are very closely related. One would expect to find evidence of degeneration in a community so small and so closely interbred, but from a physical point of view it does not appear to be present. Except for a few adolescents the men are healthy looking and of a wiry type. The women are of good physique and for the most part distinctly good looking. The children are all pale but appeared to be healthy and free from evidence of rickets. The older inhabitants speak Gaelic only, and in so short a visit it is difficult to judge the mental standard, but most of the adults appeared to be intelligent and well up to a peasant standard.

The industry of the island consists of the manufacture of coarse

[illegible] of which the [illegible] the manufacture of fulmar oil. The [illegible] is al[illegible] great demand on the mainland but is n[illegible] [illegible] used. [illegible] island possesses a parliament which is com[illegible] the [illegible] population. This assembly meets fre[illegible] and [illegible] the nature of the work which is to occupy [illegible] few days shearing, reaping or fishing.

[illegible] summer there is a fortnightly service of steamers [illegible] and it was the visit of the second of these this [illegible] appears to have caused the outbreak of illness in the [illegible] epidemic has been known since 1724, when [illegible] was almost entirely wiped out by smallpox, four [illegible] children only being left.

[illegible] anchored in the small harbour at 3 p.m. on [illegible] 21. On our arrival none of the inhabitants could [illegible] all the cottages were in sight. Shortly after [illegible] and I went ashore and were met at the [illegible] one of whom was Mr MacArthur, the [illegible] as he is called locally. He informed [illegible] of six the entire population was suffering [illegible] had commenced suddenly on June 12, and [illegible]

[illegible] given by him was as follows:— [illegible] anchored in the bay at dawn, and [illegible] is the custom had gone on board [illegible] and mixed freely with the inhabi[illegible] on the evening of [illegible] a few of the natives. On the [illegible] large number were attacked and the numbers in[illegible] until on the following Tuesday—five days later—[illegible] population (with the exception of the six already [illegible]) was affected.

[illegible] of the village during this week before our [illegible] have been [illegible]. The six subjects who escaped [illegible] were all [illegible] and unable to render any [illegible] help to the sufferers.

I [illegible] to make a house to house visit and examina[illegible] of the patients. In each cottage the conditions found were [illegible] all possible bed accommodation was fully occupied [illegible] in bed sitting huddled in shawls or lying on [illegible] In many instances there were three adults in one bed [illegible] the cottages seven or eight persons in one room

[illegible] in every [illegible] the firm [illegible] the [illegible] I some [illegible]

[illegible] tea and [illegible] appeared to [illegible] though the [illegible] supply [illegible] that [illegible] well [illegible] which there was [illegible] above the [illegible] milked [illegible] that the [illegible] of them [illegible] that [illegible] that the [illegible] including [illegible] children [illegible] being [illegible]

All the patients [illegible] suffered from the [illegible] symptoms varying [illegible] in individual cases [illegible] of sudden [illegible] headache [illegible] throat with [illegible] the limbs [illegible] and complete prostration. When seen by me a great [illegible] convalescent but among those still in the acute stage the symptoms were well marked. Temperatures ranged [illegible] 104 F. Physical signs were absent in lung areas except in [illegible] four cases in which signs of [illegible] were present.

Immediately after my examination the work of [illegible] nourishment and medicines began, the sick being [illegible] soups, beef tea, milk [illegible] cottage. Owing to the crowded condition of many of the [illegible] I was anxious to find a place which could be [illegible] temporary hospital to which some of the cases might [illegible] The only available place was the church, and permission was [illegible] readily granted for this to be taken over for the purpose. It is a small building about 35 by 25 feet with a small [illegible] attached. A working party was sent [illegible] from the [illegible] the forms which take the place of pews were [illegible] such as were required to support planking on which to place the bedding. The whole building was thoroughly [illegible] washed down with disinfectant. Deals brought [illegible] were then placed on forms along each side [illegible] canvas and mattresses and bedding, also brought [illegible] laid out.

Good accommodation was thus provided for eight patients [illegible]

[illegible] kitchen and for the accommodation [illegible] berth [illegible]. The cases for treatment in the [illegible] brought down from the cottages by stretcher parties, the [illegible] readily consenting to removal. A signalman was landed to communicate with the ship if necessary, and the arrangements [illegible] with the [illegible] were complete.

In the meantime [illegible] in Edinburgh had organized [illegible] of the Local Government Board, an inspector [illegible] of the same department, and two [illegible] with a full [illegible] provisions. The ship received [illegible] by wireless [illegible] to Oban [illegible] miles [illegible] Sunday 22nd to embark the [illegible] and bring them to St Kilda. [illegible] the stewards and [illegible] land the ship left [illegible] for Oban.

[illegible] my round [illegible] in the morning, I [illegible] improvement in [illegible] the patients and was [illegible] to my list of [illegible]. In many cases particularly among the men some [illegible] to convince them that they were better [illegible] alarmed had they become about their condition. A [illegible] presented serious symptoms [illegible] persistent vomiting; [illegible] woman who had [illegible] dyspnoea and attacks [illegible] and [illegible] early in the [illegible] and apparently [illegible] showed a recurrence of the symptoms with a [illegible]. Examination [illegible] latter case revealed slight [illegible] the heart and [illegible] soft [illegible] murmur [illegible] into the axilla [illegible] of the [illegible] temperature was [illegible] and the [illegible] better though the physical signs remained the same. [illegible] among the [illegible] complicated by the [illegible] neighbours [illegible] were a few cases of [illegible].

[illegible] the steward [illegible] disinfection [illegible] house-to-[illegible]. At 10.50 that night the ship returned from Oban, [illegible] the inspector [illegible] nurses. Early [illegible] landed with me [illegible] to the hospital and all the cottages took over from [illegible] all the patients. [illegible] a considerable [illegible] the [illegible] much larger number than [illegible] and about. The nurses were able to

[illegible] the women [illegible] greatly [illegible]

While the [illegible] at St Kilda [illegible] and the [illegible] stewards remained [illegible] of distributing food and medicine.

On the morning of the 24th the condition of the [illegible] hospital had considerably improved, and they were [illegible] their homes, the hospital being dismantled and the building [illegible] brought to its proper condition of parish church.

H.M.S. "Active" left the harbour the same afternoon [illegible] terminated an experience full of interest and quite exceptional [illegible] service in home waters.

When first the news of the outbreak of the epidemic was received it was feared that the condition found might prove to be a very serious one, for the telegram conveying the information to the authorities had been sent by the captain of a Tunisian trawler. Typhus and typhoid were thought of, and very great relief was felt when it was seen that both these could be excluded. There appears to be no doubt that the infection which caused the epidemic was introduced at the visit of the steamer on June 12.

The visitation of smallpox in 1724 is the only other epidemic which has been experienced in the island. To the inhabitants such an outbreak as the present was terrifying, and [illegible] have exercised a very considerable influence on their [illegible] added to those unaccustomed to any form of epidemic illness, the vision of over 90 per cent. of the population suddenly struck down with distressing symptoms must have been extremely alarming. The six elderly villagers who escaped the disease appear to have been terrified into inaction, and the condition of the whole village was one of helplessness. Indeed the only inhabitant who appears to have made any serious attempt to assist the patients was Mr MacArthur, who though ill himself struggled about daily giving what help he could.

The effect of the introduction of infection to a [illegible] such as this is of great interest, and in keeping with what one would expect. One may suppose that the infection was not of a virulent type, but in the event of the introduction of any form of infection more virulent the results might well be appalling.

Historical.

[illegible] HYGIENE IN THE NAVY AND ITS EFFECT ON THE HEALTH OF THE SAILORS.[1]

[illegible] W. [illegible] SIMPSON, C.M.G., M.D., [illegible]
[illegible] Naval Medical Consultant, [illegible]

[illegible] this lecture to give an account of the progress [illegible] the Navy, [illegible] the effect it has had on the health of its sailors.

[illegible] OF NAVAL HYGIENE

[illegible] will make clear some of the chief points [illegible] of hygiene in naval life, and although the [illegible] different type from what they were in Nelson's [illegible] and the system of recruiting [illegible] the health of the sailor at sea [illegible] a super Dreadnought or a ship of [illegible]. These principles consist in securing healthy [illegible] crowded conditions on board [illegible] adequate supply of pure air [illegible] suitable clothing, healthy exercise [illegible] of the methods for practising these [illegible] altered conditions.

THE AIM OF NAVAL HYGIENE

[illegible] to secure healthy men on healthy ships so that [illegible] withstand the extra strain which is imposed [illegible] bottling up a hostile fleet, and [illegible] of nerve, valour, alertness, and [illegible] skill in gunnery to destroy the [illegible] of battle. Other things being equal as regards arms [illegible] and officers on board and their condition, that matter [illegible] of the ship.

[illegible] as we are engaged in to-day, the supremacy of our Navy [illegible] the safety of our [illegible] the maintenance of our commerce [illegible] across the oceans and seas, the abolition of [illegible] trade and the blocking of his fleet. The silent vigil [illegible] the North Sea and the coast, in order to be [illegible] is effected under very trying and dangerous [illegible] of watching and waiting without the excitement [illegible]. The ceaseless vigilance has to be continued [illegible] until the enemy is pleased to issue from his protected [illegible] mine-strewn waters and on a sea in which [illegible] invisible, are likely to lurk waiting their opportunity.

[1] [illegible] Portsmouth and Plymouth on November 27 [illegible]

to [illegible] healthy [illegible] our Navy has [illegible] the [illegible] it is well treated, well fed, and [illegible]

It is [illegible] and splendid qualities of the [illegible] with its attendant risks, and still [illegible] was a greater miscalculation than [illegible] meeting the British sailor who [illegible] has no equal.

From this statement [illegible] of Naval hygiene is chiefly concerned [illegible] between battles, for its main purpose [illegible] shall live under such healthy conditions [illegible] more fit than their enemies for [illegible] as far as the medical aspect [illegible] skilful surgery, the antiseptic treatment [illegible] and treatment in healthy [illegible] the wounded under the best [illegible] safety, and in cleansing and [illegible]

The Beginning of Naval [illegible]

The application of hygienic [illegible] Navy dates back to the [illegible] necessity for our protection [illegible] began to be built. The Navy [illegible] protected Great Britain [illegible] dependencies and to [illegible] writers advocating hygienic [illegible] lives more valuable in the [illegible] those of British sailors [illegible] protection and liberties.

Ideas in regard to [illegible] from which they arose [illegible] a time when prevention of [illegible] drawn on acute manifest[illegible] that the most advanced [illegible] practised in that Service. [illegible] knowledge of to-day was the [illegible] gradually evolved from [illegible] of opinion that cleanliness [illegible] attention to the cleanliness [illegible] the services of a skilled [illegible] healthy and the men in good [illegible]

The advances in the art [illegible] fitful and associated often with [illegible] much on the views of individual [illegible] that the reforms advocated [illegible] however, that all the great [illegible] St. Vincent, Nelson, Collingwood [illegible] commanders, too numerous to mention [illegible] the welfare of their men.

Bitter Experience [illegible] Sickness [illegible]

Many bitter experience[s] [illegible] at home and abroad [illegible] extraordinary amount of [illegible] of the ships on [illegible] one [illegible] the [illegible] for example the [illegible] merchantmen [illegible] India Company lost [illegible] voyage 105 men out of [illegible] reached the Cape of Good Hope which comp[rised] four [illegible] England. One remarkable circumstance [illegible] of Captain Lancaster's ship were [illegible] in his famous voyage round the world lost [illegible] crew, and in the first nine months [illegible] out of [illegible] up the crew of the three ships [illegible] the [illegible] Gloucester and the Tryal—that [illegible] rounding Cape Horn [illegible] the worst and most tempestuous [illegible] coast of Peru. He was better off [illegible] that followed him in pursuit [illegible] provided his ships with only four [illegible]. He failed [illegible] doubling Cape Horn and returned [illegible] the Asia, and 100 men out of an original squadron [illegible] and 3 000 men. Most of Anson's men had died of [illegible] while Pizarro's men had died of scurvy and hunger [illegible] had died mostly of scurvy. Scurvy is now known to [illegible] to a defective diet aggravated by hardships and [illegible]

[illegible] expeditions failed owing to sickness on board having [illegible] to such an extent that success was impossible [illegible] Francis Wheeler's attack on Martinique in 1693 [illegible] ineffectual attempt to protect the trade of the West [Indies] against the Spanish on account of the terrible losses of men from disease.

Conditions Affecting Health of Navy

Acute observers had noticed that there were certain conditions that affected the health of the Navy. The length of the voyage was important because the salted beef and pork was liable to become tainted or decomposed and the flour and biscuits weevily and mouldy. Fresh vegetables were not obtainable except in port and the ports were not as in these days quickly reached. There was a great difference between the health of seamen in His Majesty's Service in times of peace and war and there was also a difference in health between men in the cruisers of the Channel fleet and those in fleets that went to the Tropics. It was further noticed that large new men of war built of fresh and unseasoned timber by reason of its sweating, and mould forming attributes were not so suitable for long voyages as those which were dry and well seasoned. Dry rot and fungus were not only destructive to the ship but a source of ill health to the men. Further it was observed that a damp ship was always an unhealthy ship. Then, again when epidemic disease attacked the fleet it was worse in the larger ships and the incidence was generally somewhat in the following proportion:—

In a 20 gun ship one tenth of her complement were affected
In a 60 gun ship one fourth of her complement were affected
In a 70 or 90 gun ship one third of her complement were affected

It had also been noticed that Admiral Hawke's fleet, manned by 14,000 men, which remained out at sea for over six months in all weathers closely watching the French fleet enjoyed exceptionally good health so long as it was supplied with fresh meat and vegetables, but when by reason of bad weather the transports bringing these were delayed and the fleet had to fall back on its old provisions it became sickly and unhealthy.

Dr James Lind's Works

The first successful attempt at collecting facts and observations relating to the health of the fleet at home and abroad and unravelling the causes of the excessive mortality with the object of removing and preventing them was made in 1757 by Dr James Lind a distinguished Naval surgeon. In that year he wrote two remarkable books. One was 'On the Most Effectual Means of Preserving the Health of the Seamen in the Royal Navy', the other was entitled 'A Treatise on the Scurvy' and was dedicated to Admiral Lord Anson, who seventeen years after his dreadful experience in the Southern Seas presided over the Naval affairs of Britain and who Dr Lind remarks 'consults with unwearied and successful attention the improvement of the Service in all its branches.'

The first book related to the means by which the ship could be kept free of infection and disease, the second to the food of the sailor.

Dr Cockburn on Scurvy

Dr Cockburn another Naval surgeon as early as 1696 had addressed to the Right Honourable the Lords Commissioners for executing the office of Lord High Admiral of England, Ireland, &c. a work entitled 'An Account of the Nature, Cause and Cure of the Distempers, with observations on the diet of seamen in His Majesty's Service.' He attributes the scurvy which was one of the most common diseases at that time to the consumption of too much salted pork and beef by those sailors who had the least work. He puts it quaintly thus: 'And these come just the same with that of the apes puppies in the fable, that which she hates comes to be a lusty strong monkey, while she overlays the others through her fondness. The seamen whom the boatswain turns out to their watch and who have the fatigue are in perfect health while his favourites are overrun with the scurvy.' His way of giving expression to his views were not unlike that of another sailor in modern times who, commenting on the sickness of a newly joined comrade remarked that 'no wonder he was ill for he ate, and he drank and he slept like a first class passenger.'

Dr Cockburn very rightly condemned the prevalent view that the scurvy was due to sea air but it was left to Dr Lind to establish by the collection of many observations that it was due to a defective diet which could be cured by supplementing its deficiency with fresh vegetables and fruit, and when these were not procurable by the administration of lemon, lime or orange juice, the lemon, the orange and the lime having in them a constituent element which counteracted the defects belonging to a diet in which salted meat largely entered.

Dr Lind shows Scurvy is Preventible

Dr Lind has the merit of realizing to the fullest extent that scurvy could not only be cured by juice of the lemon or other citrons and by fresh vegetables and fruits but also that it could be prevented by these

Curiously [illegible] Dutch were aware of this double property of limes and oranges [illegible] as the sixteenth century. They appear to have [illegible] their vessels to Spain to bring oranges and lemons to Holland.

[illegible] and medical men were acquainted with its value [illegible] the seventeenth century. Dr Woodall, a surgeon [illegible] Hospital, in his "Surgeon's Mate" of 1617, in addition [illegible] precious and well tried remedy for scurvy [illegible] a good quantity of the juice of lemons sent in [illegible] by the great care of the merchantmen [illegible] the surgeons also gave of the juice daily to the men in [illegible]. But between then and 1797, a period of nearly [illegible], this knowledge was apparently forgotten or only known to the [illegible] was not provided with lemon juice on his arduous and [illegible] expedition. Lancaster in 1600 gave it to the crew of his [illegible] long as it lasted with happy results, but not to the others.

[illegible] notwithstanding the clearness with which the value of fresh [illegible] and fruits, and of lime and lemon juice, is set forth in Dr [illegible] treatise, his views, though accepted and acted upon by many [illegible], were not put into general practice, and it was not until 1795 [illegible] years later, that any serious steps were taken to prevent [illegible] the Navy, and this was due to the successful result of a [illegible] of which there had been many. On a recommendation [illegible] Gilbert Blane, in 1793 the flagship "Suffolk," of seventy-four [illegible] bound to Madras, was supplied with lemon juice. The ship [illegible] nineteen weeks on its voyage, touched at no port [illegible] fresh provisions on the way, yet it arrived having had no [illegible] on board. Each man had been supplied daily with ⅔ oz [illegible] with 2 oz. of brown sugar. In 1795, on a representation [illegible] the Medical Board of the Navy during the administration of Earl [illegible], order was issued for a general supply of lemon juice to the [illegible] with more variety in the diet. The effect of the [illegible] lemon juice and a greater variety in the scale of diet [illegible] in the reduction of the number of cases of [illegible] the Navy. In 1780, before the reforms were introduced, the [illegible] 1,743 sick men to the Haslar Hospital, and of these [illegible] per cent. were from scurvy. In 1800 only sixteen men [illegible] scurvy, while in 1806 and 1807 the admissions [illegible] only one a year. Scurvy is now practically extinct [illegible] Navy. A regular supply of lemon juice kept H.M.S. [illegible] her Polar Expedition free of scurvy for two years, and [illegible] insufficient food, defective diet, and the hardships [illegible] conditions brought on the disease.

[illegible] similar instance of the influence which a change [illegible] to one in which the constituent elements are in full [illegible] in the Japanese Navy. In that force the men used [illegible], a disease similar in some respects to scurvy, but [illegible] to defects in quantity and quality of the salted meats combined [illegible] deficiency in fresh vegetables, as in scurvy, but, on the other [illegible] due to a defect, both in quantity and quality, of the rice on which the Japanese sailors mainly subsisted, combined with a deficiency in animal food. Rice is poor in nitrogenous elements; meat and fish are

[illegible] quantity [illegible] the ventila[illegible] the [illegible] Japanese [illegible]

Co[illegible] Mor[illegible]

In [illegible] ability in the [illegible] and [illegible] and [illegible] W[illegible] opportunity [illegible] English [illegible] accidental [illegible] on the [illegible] West Indies [illegible]

One [illegible] fleet [illegible] become [illegible] to disease [illegible] diseases [illegible] mortality [illegible] sumption [illegible] the hosp[illegible] typhus fever, small pox, [illegible] is reduced [illegible] dysentery [illegible] that are stationed in the Tropics [illegible] included jail typhus [illegible] and on the West Coast of [illegible]

[illegible]

Jail fever, which probably [illegible] prevailed in the overcrowded [illegible] 1750, i.e. seven years before the [illegible] caused one of those Black Assizes [illegible] by the infection spreading from the [illegible] jurors and other persons attending [illegible] Black Assize, which was fortunately the last and [illegible] at the Old Bailey, the Lord Mayor, two judges [illegible] of the counsel, some of the jury and about [illegible] attacked and died in addition to a number [illegible] risk of discharged prisoners spreading [illegible] persons or by infected clothing, and [illegible] conveyed from the prisoners to the [illegible] The first English fleet sent to America [illegible] 2,000 men.

The Outside Sources of Danger [illegible]

In the matter of recruitment in the [illegible] nation exercised as to who was healthy [illegible] outside sources of danger were even [illegible] by the medical officers to threaten the health of the fleet from the [illegible] of [illegible]

One was [illegible] had [illegible] from a long [illegible] suffering from the [illegible] The other was [illegible] persons, the [illegible] or their clothes the seeds of infection [illegible] habit [illegible] the infection into the fleet This latter danger depended on the [illegible] of prevalence of infectious diseases in the country at the time, and in the eighteenth century it was considerable generally being small pox, pestilential fevers putrid sore throat or scarlet fever

Measures Recommended to Prevent Disease being Conveyed into the Navy

To restrict these dangers Dr Lind recommended the institution of registers of the men recruited in order to separate them into classes so that they might be differently treated For the sailors who had just arrived from a long and sickly voyage it was recommended they should be isolated on shore and placed on fresh provisions and sufficient greens in lieu of salted meats This diet together with fresh air was to be continued for three weeks, by which time they would be fit for service

For the impressed landsmen it was recommended that certain precautionary measures should be taken to prevent infection being imparted to the menships These were that the landsmen should be isolated on a tender or preferentially on a lazaretto on land for at least fourteen days that their old clothes should be destroyed and new ones given them and that their persons should be well purified and cleansed

Minute instructions into which I need not enter are given having for their object the suppression of infectious and contagious disease when it broke out on board ship and the purification of the ship The internal economy of the ship and the condition of the men on board also form an important part of the instructions for the preservation of the health of seamen and consists in rules for the cleansing ventilation, and dryness of the ship maintenance of cleanliness of the men their clothes and bedding, and provision of a good drinking water Dr Lind designed an apparatus for distilling sea water

Ventilation in Ships

It is noticeable in these instructions the great importance attached to the purity of the air and the value of good ventilation The middle of the eighteenth century was distinguished by the awakening interest taken in the quality of the air as a factor in disease and the necessity for finding some practical means of securing greater purity of the air which was breathed in confined places occupied by large numbers of people In 1756 the incident of the Black Hole of Calcutta occurred in which 146 prisoners of the Surajah Doula were shut up for the night in a compartment whose cubic space gave scarcely 40 ft for each inmate of the 146 no fewer than 123 were found dead in the morning, and the survivors were poisoned to such a degree that after they recovered their senses they broke out in boils all over their body The ill effects of foul air in the lower decks of men of war had been for many years impressed on naval men, and attempts were made by

various devices [illegible] ventilation to [illegible] air supplied to [illegible] Hales and Sutton [illegible] distinctive in their [illegible] tried. As early as 1756 the Lords Co[illegible] Admiralty issued [illegible] Dr Hales's ventilator [illegible] Royal Navy.

Dr Lind definitely [illegible] is ventilation [illegible] board ship for maintaining [illegible] of any circumstance [illegible] proper ventilation [illegible] lessens the [illegible] arrests the progress of highly c[illegible] or pestilential [illegible] is an observation of great importance.

Tents and Huts as Hospitals for Malignant Contagious [illegible]

Pursuing the subject further, it is laid down that the [illegible] hospitals receiving these cases from ships should be different [illegible] diseases, which is the plan ordinarily adopted in our modern [illegible] disease hospitals, and, further, that the wards [illegible] ought always [illegible] airy, and where the contagion was malignant, spacious [illegible] the fields adjoining, are greatly preferable to any [illegible] for dissipating infection and for the recovery of the diseased. [illegible] is given when during war one of the hospitals was found [illegible] for the reception of the large number of patients, [illegible] in the fields for many of the men. "These poor fellows [illegible] to be badly accommodated, but it was very observable that [illegible] whole in the cold huts recovered, when the mortality in the [illegible] due to hospital fever was so great that in some wards not [illegible] occupied."

Similar Arrangements Afterwards Adopted in the Army [illegible] the Sick and Wounded

A year after Dr Lind's book was written Dr Brocklesby [illegible] physician to [illegible], owing to the impossibility of obtaining [illegible] accommodation for many of the sick soldiers returning [illegible] from the war in France, was obliged to erect in the open [illegible] shed with straw roof to keep out the rain. It accommodated [illegible] patients, and so badly was it made that the soldiers [illegible] exposed to the winds and the vicissitudes of the weather [illegible] Brocklesby's surprise remarkably fewer died of the same d[illegible] treated with the same medicines and the same general [illegible] did anywhere else, and all the convalescents recovered [illegible] than they did in any of the warmer and closer huts and bar[illegible] round Newport.

This experience led Dr Brocklesby to build temporary [illegible] of wattle with [illegible] roofs when required, and used them [illegible] to others. Excellent results followed even in [illegible] pestilential [illegible]

An Experience with Plague in the South African War in 1901

I had a similar experience during the South African War. When plague broke out in Cape Town a temporary hospital was built, one of the wards of which on inspection I found to be constructed in such a manner as to be badly lighted and badly ventilated, and overcrowded with patients. The result was that fatal pneumonic plague was spread among the patients and nurses. I had a large [illegible] erected o[illegible]

the ground [illegible] the patients with the immediate effect that [illegible] resumed a milder ty[illegible]

T[illegible]

I[illegible] method applied [illegible] advan tages [illegible] large [illegible] and [illegible] We do not need for [illegible] hospitals [illegible] emergency times, exp[illegible] so long as th[illegible] good floor raised f[illegible] and [illegible] to secure [illegible] cleanliness comfort [illegible] privacy In training and permanent camps [illegible] sacks slung for beds will keep the men in good health [illegible] pneumonia

J[illegible] at its Source

The measu[illegible] applied had an excellent effect in [illegible] infection into the Navy But as regards jail fever [illegible] always great until the fever was attacked at its source This [illegible] accomplished by John Howard, who in his capacity as Sh[illegible] first drew attention to the shockingly [illegible] condition of the jails in that county, and later by his [illegible] of the condition of the jails of England succeeded in [illegible] to pass a Sanitary Act in 1774, for the improvement of the [illegible]

The condition of [illegible] may be imagined by the fact that Howard had to ride in [illegible] windows always open because after his visits he could not [illegible] the smell of his clothes or notebook Although [illegible] jails were gradually freed of this pestilence [illegible] and flourished in the overcrowded and insanitary hous[illegible] the poorer quarters of our large towns until [illegible] Its abolition was finally effected by the introduction [illegible] sanitary measures relating to cleansing [illegible] recommended by the different Health Comm[illegible] the early years of Queen Victoria's reign, and of which Sir Edw[illegible] Secretary

Captain Coo[illegible] Voyage [illegible] the World without a Death from S[illegible]

Much of Dr Lind's [illegible] by many of the captains and surgeons with correspond[illegible] results but it was not until nearly twenty years [illegible] impulse was given to the movement for the improvement of the health of the Navy by the return of Captain Cook from his voyage [illegible] the world in the "Resolution" and which had taken him three years and eighteen days He had, with a crew of 118 men lost only four men two of whom were from drowning one from a fall, and only one from disease who had died of consumption without any signs of scurvy Captain Cook had followed the advice of Dr Lind He had started also under very different conditions from

[illegible] 1740 [illegible] plans had [illegible] to the Admiralty [illegible] he put on board [illegible] experience [illegible] [illegible] health of the [illegible] protests [illegible] influences [illegible] [illegible] and [illegible] [illegible] including officers [illegible] perished and [illegible] round the world [illegible] can real [illegible] man who fought [illegible] fortune of the [illegible] threatened him and his men with [illegible] his courage, tenacity of purpose, deter[illegible] succeeded in the enterprise he set out to accompl[illegible].

M[illegible] ADOPTED BY CAPTAIN COOK

In a pap[illegible] 1776 to the Royal Society the measures [illegible] which C[illegible] his success are described. They consisted in providi[illegible] well ventilated ship, storing it with good provisions [illegible] and an abundant supply of fresh water, fresh [illegible] every port when procurable. Certain rules of living [illegible] attached great importance were strictly enforced. [illegible] of the ship's coppers so that they [illegible] always clea[illegible] was paid to cleanliness and dryness of the ship. [illegible] occasions the men were put in two watches [illegible] that they might have sufficient undisturbed sleep [illegible] that the men kept themselves clean and [illegible] and clothes were kept clean and dry. [illegible] and a strict discipline on these matters was [illegible] secured for him from the Royal Society Sir [illegible] It was awarded by Sir John Pringle, a celebrated surgeon [illegible] the distinction of having been the first to suggest after [illegible] that the hospitals of opposing armies should be treated as [illegible]. The suggestion was favourably received and was gene[illegible] the Geneva Convention in 1864, when it became a mat[illegible] agreement. During the present war, however, the Red Cross appears to have lost much of its sacredness in the eyes of the Germans.

Although Captain Cook's paper attracted much attention at the time

[illegible] Annual [illegible] [illegible] Proportion [illegible] [illegible] Sent on Shore [illegible] Hospital [illegible] [illegible] during those [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	60 000	[illegible]
[illegible]	70 000	[illegible]
[illegible]	85 000	[illegible]
[illegible]	90 000	[illegible]
[illegible]	100 000	[illegible]
[illegible]	110 000	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible] 000	[illegible]
[illegible]	100 000	[illegible]
	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]
181[illegible]	[illegible]	[illegible]

Sir Gilbert Blan[illegible] [illegible] had [illegible] discovered and put [illegible] the health [illegible] of seamen had the [illegible] was between 17[illegible] and 181[illegible] in the [illegible] War the whole stock of sailors would [illegible] of the country could not [illegible] the Navy.

Subsequent [illegible] a remarkable change in the health of the Navy [illegible] and epidemic fluxes are diseases of the past. [illegible] was not unfrequent at the end of the [illegible] on a cruise with the Channel fleet to suffer [illegible] happened in the *Intrepid* that almost the [illegible] or were sent to the hospital on arriving at [illegible].

As medical knowledge has advanced [illegible] which to [illegible] of advantage to the Navy has [illegible] the [illegible] of successive

Medical Director Generals been [illegible] of the Service.

Dysentery, cholera, and typhoid [illegible] are known, are no longer epidemic in the [illegible] in the Tropics are mostly of a sporadic [illegible] lost its powers of destruction and [illegible] the former scourge of our Naval men [illegible] control. In 1905 Mediterranean [illegible] most frequently by drinking unboiled milk [illegible]. Since that there has been no danger of contracting [illegible] Malta hospitals from drinking milk, and there has [illegible] rapid reduction in the number of cases of this disease [illegible] 1911 and 1912 they were reduced to six and four respectively [illegible] 1906 they numbered 216 and 370 in 1905.

Among improvements that have taken [illegible] be mentioned: The supply of pure water by condensing [illegible] of Normandy's condensers and filters; the employment of [illegible] quinine for the treatment and prevention of malaria [illegible] in tropical climates; general vaccination against small pox in 1811 [illegible] interest taken by the officers generally in the preservation of the health of the men; a higher standard of cleanliness demanded [illegible] both for the men and the ship; the providing of drying [illegible] for men's clothes; and the discarding of the daily practice of [illegible] the lower decks, which was a fruitful source of catarrhs and [illegible] complaints. There is also the antiseptic treatment of wounds and the abolition of hospital fever. There are other improvements which have [illegible] affected the health of the Navy. Regulations were introduced to [illegible] and risks of disease connected with the impressment [illegible]. The right of impressment has not been exercised since the Napoleonic wars, but it is not abolished. In 1853 the method of bounty was [illegible] in preference along with continuous service and hitherto in any emergency there has been no need of resorting to compulsory recruiting, owing to the popularity of the Navy.

Annual Death-rate in the British Navy from Disease

Average Rate of Mortality

1776–1780	1 death in 8 sailors
1810–1813	1 — 30
1830–1836	1 — 72
1885	1 — 113
1895	1 — 113
1905	1 — 356
1907	1 — 298
1910	1 — 311
1913	1 — 309

Gradually there has been evolved a system of recruiting under medical supervision, which has reduced to a minimum the danger of importation of infectious diseases into the Navy, and secures at the outset healthy boys and healthy men. Recruits now undergo a careful medical examination, and the unfit are weeded out and rejected. Those that pass

[illegible] ks and training [illegible] when they [illegible] training. During this period they are [illegible] transformation that generally takes place [illegible] remarkable.

[illegible] of the Navy of the various sanitary reforms [illegible] improvement in medical and sanitary treatment [illegible] such steam and coaling stations have brought [illegible] ports has been most marked, as is seen [illegible]

[illegible] annual death rate during time of peace, the [illegible] adds new problems to be solved to maintain [illegible] Navy, and this is especially the case in [illegible]

[illegible] appointed by the Admiralty to inquire into [illegible]

[illegible] Naval life afloat and ashore as affecting the [illegible] ations.
[illegible] with the disease in the Navy.
[illegible] offered for facilitating the early [illegible] and minimizing the chances of its [illegible] ship's company.

[illegible] of the Committee a number of further [illegible] sanctioned by the Admiralty and [illegible] appointed to investigate and report on the best [illegible] modern [illegible] After an exhaustive inquiry the [illegible] very important recommendations which the [illegible] carried out not only when new ships are being [illegible] when the opportunity arises in those already built.

Clinical and Practical Notes.

NOTES ON THE WORK OF A NAVAL HOSPITAL SHIP AT THE DARDANELLES.

By [illegible] TREVOR COLLINGWOOD, M.A., O. [illegible]

[illegible] H.M. Hospital Ship [illegible]

The [illegible] is a converted transport of 6,000 [illegible] tons [illegible] [illegible] for 202 cases, with arrangements [illegible] [illegible] beds [illegible] emergency. This article [illegible] more [illegible] [illegible] done by a Naval Hospital Ship than [illegible] [illegible] account of every wounded case [illegible] [illegible]

The [illegible] of the wounds [illegible] by shot and shell, shrapnel and bullet [illegible] by [illegible] from a hydroplane. The [illegible] [illegible] and demolition of the forts at the [illegible] [illegible] and March 12, 1915, 187 Naval [illegible] [illegible] there was a [illegible] only four wounded [illegible] on board. The next operations consisted in a landing of the [illegible] supported by the Navy [illegible] from both [illegible] Straits. From April 25 to May [illegible] wounded were received [illegible] Military and 10 Naval [illegible] admitted on the first day [illegible] the Army [illegible] ashore, the [illegible] drew to a safe anchorage.

For convenience [illegible] the remarks may be divided [illegible] parts:—

PART I.

On February [illegible] the [illegible] arrived at Tenedos about noon [illegible] the evening [illegible] of the ship [illegible] and 7 wounded were [illegible] afterwards [illegible] show [illegible] been hit by shell [illegible] (1) Extensive lacerated wound [illegible] biceps and triceps and [illegible] compound fracture of right humerus about [illegible] (2) Amputation below right knee for shattered leg. (3) Large shell wound with pulping of calf and shattered [illegible] fragments of which had to be removed. (4) Extensive deep shell wound of right thigh 6 in. by 8 in. [illegible] splintered also wounds of [illegible] on March 3 [illegible] the [illegible] signs of tetanus [illegible] from tetanus at [illegible] on March [illegible] The [illegible] was found [illegible] from the wound. Antitetanic serum [illegible] [illegible] was discovered [illegible] of interest [illegible] that the [illegible] on board were protected by [illegible] [illegible] brought from England, and that some of the [illegible] by the shell [illegible]

On February [illegible] a party of men landed from the "Vengeance" and the [illegible]. The following wounds were received: (1) The right eye so damaged, probably by splinters [illegible] from a wall, that it had

[illegible] be removed [illegible] bullet wound through the left shoulder [illegible] showed a hole [illegible] scapula and star shaped fracture of upper end of humerus (3) A compound fracture of right humerus (4) A compound fracture of the upper right femur The two latter were caused by shell [illegible] and falling [illegible]

The same day [illegible] ratings were admitted from the "Vengeance" with extensive scalds, nearly all the skin being implicated 2 died and 3 recovered I understand the accident was caused by the bursting [illegible] water tube.

On March [illegible] 5 men with splinter shell wounds were received from [illegible] 6 in casemate having apparently been struck by a shell [illegible] concealed howitzer battery Two cases may be mentioned (1) Numerous small punctured wounds of the face eyes undamaged big bruise over right eye a cut on the left upper lip one splinter having penetrated the left cheek knocking off the left premolar tooth, and a superficial wound [illegible] long in the right neck immediately over the jugular vein In addition there were about forty small splinter wounds on the left upper and lower extremities He however was quite fit to return to his ship on March 13 (2) Sustained a vertical wound of corner of left eye opening both chambers causing escape of vitreous and opacity of the lens On the second day he developed broncho pneumonia which rendered it inadvisable to give an anaesthetic for its removal He was subsequently discharged to Royal Naval Hospital Malta

On March 4 and [illegible] 22 cases of bullet wounds were received from men forming a demolition party, 16 being Marines from the Transport "Braemar Castle" It is not possible to go into the details of each case, but mention may be made of the number of times bullets penetrated different parts neck 1 chest 5, abdomen 3 hand and arm 3 leg and foot 4 back 3 leg and arm 1 jaw 1 In the 5 bullet wounds of chest there was penetration completely through in 4 cases and slightly in 1 but though most of them were suffering greatly from severe collapse and 1 from haemorrhage they all recovered In 2 of the 3 abdominal cases there were entrance and exit wounds from one of which the omentum protruded The abdomen was opened and found filled with blood but his condition was too grave for anything further to be done In the other case operation was not possible They both died next day In the third case there was only a wound of entrance on the right side but marked pain was complained of in the right iliac fossa and he nearly died from collapse subsequently the abdomen was opened owing to the fixed pain and an inflamed appendix was removed however no trace of the bullet was found in psoas muscle or elsewhere Recovery was satisfactory One of the bullets used was sharp pointed, about $1\frac{1}{4}$ in long and weighed 163 gr

On March 6 two flight officers fell from a considerable height into the sea One sustained a dislocated shoulder and suffered severely from shock which was accompanied by retention of urine requiring catheterization The other with only minor injuries also suffered from shock

On March 12, 3 cases were received having been wounded near Smyrna A sub lieutenant who landed on duty sustained a bullet wound The missile entered the left buttock and passed out of the left groin just above the left inguinal ligament At first it was thought that it had

passed through the [illegible] but no symptoms [illegible] resulting, [illegible] had [illegible] and [illegible] satisfactorily

[illegible] wounds and somewhat similar [illegible] [illegible] of [illegible] lower ends of both bones [illegible] left leg [illegible] compound [illegible] fracture of both bones right leg [illegible] the latter [illegible] passed right through [illegible] the former a piece [illegible] had almost traversed the limb was extracted on board the [illegible] Both were treated at the time with pure carbolic [illegible] antiseptic serum The wounds of the right leg [illegible] six days after foul and septic and were under an anaesthetic [illegible] treated with pure carbolic The wounds of the left leg were [illegible] and were not again treated with carbolic yet after a few days both cases appeared to be going on satisfactorily This may be of [illegible] interest in connection with the present discussion about early treatment of wounds with pure carbolic The second application, though not quite orthodox was apparently beneficial

On March 14 35 wounded were [illegible] and 22 from the Amethyst and 3 from Trawler No 318 Mention may be made of some of the cases (1) Severe shell wounds of left forearm and hand with slight injuries of right hand and left [illegible] the thumb was amputated and the fragments of carpal bones removed (2) numerous small splinter wounds of head face and nearly every part of the body and limbs from which fragments of cast iron were removed together with one smaller circular piece of brass [illegible] The right eye was so damaged that subsequently it had to be enucleated There were besides two large lacerated wounds of the left side of the chest and axilla from which two severe attacks of hæmorrhage occurred On arrival on board a few hours afterwards nearly all the wounds were septic, and his condition was very serious but he ultimately recovered satisfactorily

Two others who had previously received three days treatment in the French hospital ship 'Canada' were brought on board (1) Deep wound across base of nose opening up frontal sinuses on the left side and carrying away roof of left orbit The dura mater was exposed, both eyes were extensively damaged and there was complete loss of sight The wounds commenced to granulate before his discharge to Royal Naval Hospital, Malta (2) Small wound of right eyelid but the eye was pulped and merely tags of the sclera remained in orbit The left eye was normal except for subconjunctival hæmorrhage

At 6 45 p m , March 18 2 wounded officers and 13 men were received from the Inflexible The two officers were both suffering from prolonged shock and were almost pulseless In one case the right forearm was pulped and most of the hand blown away requiring removal below the elbow there was also a large scalp wound with depressed fracture of skull and many wounds of left arm and leg caused by fragments of shell His condition made further operation impossible and he died at 1 35 p m The other officer had sustained a severe wound of the left thigh caused by a large piece of shell $3\frac{1}{2}$ in square which entered the left groin and shattering the bone and soft parts passed right down into the leg Operation was out of the question The piece of shell with fragments of

letters [illegible] plac[illegible] 30 [illegible] March [illegible]

[illegible] Majestic also [illegible] extensive shell wound [illegible] sustained a compound fractu[illegible] a compound fracture of left radius [illegible] admitted from the Albion one of [illegible] condition. In this case amputation above [illegible] performed for a shattered forearm and two d[illegible] the left forearm had to be amputated. There [illegible] of the jaw with a wound penetrat ing [illegible] [illegible] This man however did not [illegible] Naval Hospital Malta on March 27. Another [illegible] fracture of the left fronto parietal region [illegible] About a square inch of both tables [illegible] [illegible] meningeal artery was exposed but [illegible] [illegible]

In [illegible] officer and 15 men were re [illegible] condition. The officer [illegible] the right shoulder necessitating [illegible] humerus about 2½ in square [illegible] wounds. On March 2[illegible] [illegible] Malta where I understand he [illegible] right femoral artery. The [illegible] shell wound of the right [illegible] recovered in spite [illegible] [illegible] Later on in the day [illegible] with minor injuries to the [illegible]

O[illegible] officer wounded 3 were dangerous [illegible] wounds 4 were severe and 2 slight [illegible] wounded, 6 of whom died 2 from [illegible] tetanus) and 2 from severe scalds [illegible] comparatively slightly.

[illegible] with the wounds. Skull 3 [illegible] amputation 1) forearm both bones 3 [illegible] fingers 2 [illegible] putation 1) ribs 1 spine 1 [illegible] both bones of leg 4 (amputation 1) tibia [illegible]

[illegible] eye injury loss of sight of one eye resulting [illegible] both eyes in 1 instance enucleation of one eye [illegible] In 3 cases paralysis was caused by the [illegible] plexus (bullet wound) and in the other to the [illegible] of skull. In 3 cases in which there were [illegible] some temporary paresis of the [illegible] but there was no evidence of this [illegible] Two men without any injuries appeared to h[illegible]

[illegible] in connection with the wounded 17 [illegible] operative treatment was required and 8 for minor [illegible] amputations arm 1 forearm 3 leg 1.

[illegible]

Part II

[illegible]

as [illegible] as possible [illegible] the circum[illegible] who [illegible] special atten[illegible]. The p[illegible] abdomen [illegible] rendered [illegible] of the [illegible] which [illegible] small intes[illegible] the original wound was [illegible] and the [illegible] which occurred shortly afterwards.

Two [illegible] performed (1) Left arm for [illegible] bullet [illegible] humerus. Patient was a healthy young [illegible] there was [illegible] and he was up in two days. Four [illegible] bullet wounds [illegible] right arm 1, left hand 1, right thigh 1, [illegible] right leg 1 [illegible]

Though I [illegible] favour of crowding so many wounded together between decks [illegible] it can be done for a short time and the air between decks was quite fresh and good during this period.

On April [illegible] the military wounded were transferred (except one who died [illegible] with extensive damage to the face and loss of lower jaw) to the "Aragon," an Army hospital carrier bound for Alexandria, leaving the "Soudan" with 70 patients including 25 naval wounded. This afforded an opportunity to clean out the wards and get them ready for occupation.

On April 29 38 wounded and injured were received, viz. 9 naval and 29 Marine Brigade. Of these one case may be recorded: small bullet or shrapnel wound at back above cleft of nates and another in front just above and to left of symphysis pubis; missile had been extracted; the first urine passed was stated to be blood stained, and patient subsequently suffered from colic and diarrhœa, but recovered satisfactorily.

On April 30 the "Soudan" was ordered to Gaba Tepe, and in the afternoon transferred 28 cot and 55 walking cases, consisting of Naval ratings and Marine Brigade, including 3 cases of enteric from ships to the hospital carrier, "Somali," for passage to the base hospital. We retained 24 of the more seriously wounded.

In the case of an A.B. the bullet had entered the back at level of sixth dorsal vertebra, and 2 in. to left of middle line, but there was no wound of exit. He was paralysed below umbilicus and there was slight hæmoptysis with dulness and crepitations at base of right lung. He was sent subsequently to a base hospital.

On May 1, 7 men belonging to ships were brought on board with bullet wounds, one rather serious from the "London," with a perforating bullet wound of chest from axilla to axilla. There was however only slight hæmoptysis and as his condition remained quite good he was sent to a base hospital.

On May 2, the Army having established a footing ashore, the "Soudan" for several reasons was ordered to withdraw to a safer anchorage a little way off.

During this period from February 25, 1915, to May 2, 1915, 733 cases have been treated on board, viz.:—

Wounded	570
Ordinary medical and surgical	163
Total ...	733

On May 17, at noon, the "Soudan" was again placed at the disposal of the Military, and proceeded to Gaba Tepe to receive wounded from

the Australian and New Zealand co[illegible] On this d[illegible] 18th 90, and on the [illegible] 190 were a[illegible] but later in [illegible] of the less severely wounded and sel[illegible] to th[illegible] an Army hospital carrier [illegible] had [illegible] that as [illegible] the "Soudan" was to receive only [illegible] wounded [illegible] prompt and expert surgical treatment [illegible] and on the 21st 30 making in all [illegible] case[illegible] being medical included amongst the wounded were [illegible] Nine wounded prisoners were also received including [illegible] lieutenant and Turkish warrant officer Three of these died—[illegible] gangrene supervening on severe wounds (1) compound fr[illegible] right forearm (amputation) and (2) severe gunshot wound left knee The only other case of gangrene was in an Australian with severe injuries and loss of part of left foot stated to have been caused by a hand grenade No cases of tetanus developed on board

Of 2[illegible]3 somewhat more severely Army wounded the following regions were damaged —

Head	[illegible]8
Chest	28
Abdomen	21
Upper limb	[illegible]8
Lower limb	69
Eye	16
Total	[illegible]

Out of these 10 died from severe wounds —

Head	[illegible]
Chest	[illegible]
Abdomen	1
Upper limb	1
Lower limb	[illegible]
Total	10

During this period [illegible] naval wounded only were received from the "Amethyst" wounded by shrapnel or when the ship was under fire near Smyrna 1 died from severe abdominal injuries involving the bladder no operation was considered feasible

During this period some 60 anæsthetics were given for major operations—6 laparotomies with [illegible] deaths and 6 amputations with 1 death and for examination and dressing of some severely wounded The "Soudan" left the Dardanelles on May [illegible] and arrived at Malta on May 24 when all the Army wounded were transferred to the old military hospital at Valetta and were accommodated in the large ward, over 500 ft in length used in the past by the Knights of Malta

[illegible] EXPERIENCE OF [illegible] CARBOLIC PASTE [illegible] THE [illegible] WORK OF A SHIP

[illegible] ([illegible] Department.)

[illegible] the supply of [illegible] to our armamen[illegible] only in March [illegible] and experiment [illegible] dressing for [illegible] of surgical injury [illegible] conditions [illegible] as boils and [illegible] paste was [illegible] adeps lanæ [illegible] candle [illegible] beeswax at [illegible] proportions [illegible] the Committee [illegible] by the Medical Director General [illegible]

Hydr[illegible] wool fat [illegible]
Candle wax [illegible]
Carbolic acid pure [illegible]

[illegible] has been applied as a [illegible] in previous [illegible] application of lotion [illegible] than fifty con[illegible] of surgical conditions [illegible] compound fractures [illegible] either applied directly [illegible] spread [illegible] gauze and this was applied [illegible] The result [illegible] uniformly good. Not [illegible] of surgical injury which [illegible] already septic when first [illegible] the slightest sign of [illegible] after this paste has been applied [illegible] septic cases such as boils [illegible] infected wounds [illegible] have cleared up in what was to us a very [illegible] way. Of the two compound fractures the first would almost [illegible] have suppurated and the patient would have lost a toe; one had grave doubts as to the wisdom of [illegible] it at the time but the result has been so good that one would now have no hesitation in a similar case.

[illegible] case which showed the value of this paste was an electric burn about [illegible] on the back of the right hand and fingers. [illegible] was all of the second degree. The paste was spread thickly [illegible] applied directly to this. We wished to find out how much pain [illegible] caused by the direct application of this to a burnt [illegible] and we were agreeably surprised when the patient said that it [illegible] for more than a few minutes. The result was excellent [illegible]

Spread [illegible] gauze pretty thickly, the gauze then being rolled [illegible] it is an ideal packing material for abscess cavities and [illegible] We [illegible] to procure white beeswax and the paste is in consequence more elegant but so far as can be ascer[illegible] is no more efficient. One hopes that this short note will be of use to others.

A PERSONAL [illegible]

By Staff Surgeon [illegible] M. D[illegible], [illegible]

As I have suffered from [illegible] much [illegible] I thought an account of my own case might be of [illegible], though I admit I have no original ideas to offer as to the [illegible] say at once that I am convinced beriberi is [illegible] due to eating [illegible]

Perhaps it would be best to describe my mode of [illegible] prior to the onset of the disease

H.M.S. "Pelorus" arrived at Muscat direct from England about the middle of July 1912 and was employed on blockade in the Persian Gulf continuously until long after I went to hospital in June 1913 We had therefore been employed on this most monotonous and depressing duty for nearly a year Weeks often passed without a chance of landing, and even then active exercise was limited to the two or three hours before sunset

Accommodation

The wardroom was not well ventilated and at times became unbearably hot Breakfast and tea were the only meals served there as we always had lunch and dinner on the poop

My cabin on the lower deck was small and badly ventilated The scuttle could not be opened except on the few occasions when we were in harbour or when the sea was absolutely calm I invariably slept on a camp bed on the poop and used my cabin only for dressing and when writing

Climate

For the three months previous to my breakdown the average daily temperature of the air in the shade was —

	Maximum	Minimum
March	72 26° F	67 00° F
April	82 80° F	78 13° F
May	84 92° F	79 78° F

The air was very humid and at night the decks became dark with damp In the early mornings the awnings were often dripping with moisture, and my bedding always felt damp There was generally a difference of only three or four degrees between the dry and the wet bulb thermometers

Food

Our meals and meal hours were very similar to those in any wardroom of a home ship Most of the food, however was tinned Sheep and occasionally bullocks were taken on board alive each week and killed as required All these animals looked badly fed, but, except in two cases the carcases were quite sound The mutton was tough and tasteless Fresh fish was nearly always available Tinned milk and butter were always used, but occasionally fresh green vegetables could be obtained from a safe source Almost all our tinned food was purchased from the Army and Navy Co operative Society and was excellent in quality Fruit, consisting of oranges and apples, was sent weekly from Karachi and was

[illegible] were dry and old. In the ward [illegible] exhausted in four or five days [illegible]

[illegible] of rice. This was obtained by [illegible] Stores. We had rice served in [illegible] and occasionally as a pudding [illegible] not partaken of to a greater [illegible] mess, and possibly less than in many where [illegible]. We all found we were eating less food than [illegible]. With regard to alcohol, the consumption was very [illegible] lime squash being by far the most popular [illegible]

[illegible] was distilled on board, and we made our own soda [illegible]

COURSE OF THE DISEASE

I [illegible] memory to rely on as to the dates on which [illegible] commenced, so I cannot give these details with [illegible]

It [illegible] very early in April when I first noticed I was [illegible] The monotony of the tough tasteless mutton was [illegible] for my last month or more on board I refused [illegible] I lived on small quantities of tinned food or ham.

[illegible] to be of interest. Was my loss of appetite an [illegible] disease, or was my abstinence from fresh meat [illegible] Manson (1911) states that digestion goes [illegible] Castellani and Chalmers (1913) give loss of [illegible] earliest symptoms.

[illegible] my legs ached severely after merely mounting [illegible]

[illegible] April I first noticed a little oedema round the ankles [illegible] not constantly present until about the middle of [illegible] never very marked. When I first noticed the oedema [illegible] thesia, and my knee jerks were normal.

[illegible] a greater effort to move about, and early in May [illegible] tactile anaesthesia of the skin over each internal [illegible] I thought my knee jerks were then slightly diminished. [illegible] area gradually increased until it reached to just below [illegible] I also found an isolated oval patch of anaesthesia about half [illegible] palm of the hand on the left side of the abdomen about the level [illegible] and there was tingling and numbness of the ulnar side [illegible] of the left little finger and the ulnar side of the left [illegible] The sight of food was nauseating and I lived chiefly on slops.

On May [illegible] I went to bed feeling, if anything, rather better. As usual I [illegible] to the wardroom and had a cup of tea. About [illegible] to dress. As I stepped into my bath I almost fell [illegible] violent throbbing in the vessels on each side of [illegible] The sensation was extremely unpleasant and alarming. I sat [illegible] and after a while managed to reach my bunk. The throbbing [illegible] two and this was the only cardiac attack I had. H.M.S. [illegible] was called up by wireless, and within a few hours

I was seen by Staff Surgeon [illegible]. He found my legs anæsthetic and the knee jerks lost, but so far as I know physical examination of the heart revealed nothing.

I was sent to the Station Hospital at Colaba, Bombay, by British India mail steamer on June 2, the voyage occupying five days. I left very much better then, but the [illegible] continued.

I was in hospital for two weeks, the first being spent in bed. My appetite soon recovered, but walking was difficult and rather painful, and going upstairs a very slow proceeding. My calves were wasted, flabby and very tender. Treatment in hospital consisted of massage to the legs and belladonna externally.

I was invalided home and left Bombay by P. and O. on June 21. During the voyage I steadily and rapidly improved, and at the end of three months sick leave, during which I had a further course of massage and electrical treatment, I was quite well except for some muscular weakness of the calves.

The last symptoms to disappear were the numbness and tingling of the left little finger.

REMARKS.

In trying to arrive at some conclusion as to the etiology of beri-beri in this case certain facts must be kept in mind:

(1) My [illegible] did not differ in no way from that of the other officers until the beginning of April.

(2) During April and May I had no fresh meat.

(3) No other officer abstained from fresh meat for more than a day or two at a time.

(4) No other officer contracted the disease.

(5) Rice was not eaten to any great extent by the officers.

(6) The staple diet of the Seedies on board was rice. No cases of beri-beri occurred among them.

(7) Several of the officers were frequently and severely bitten by mosquitoes (Culex). I was very much bitten.

(8) Six cases of beri-beri were on board for less than forty-eight hours [illegible] February 13, taking passage to the hospital ship (H.M.S. "Perseus") [illegible] another after having been [illegible]. I was the only officer who came [illegible] close contact with these cases, but the [illegible] berth steward was in [illegible] and longer contact and did not contract the disease.

[illegible] this way there is only one point which stands out clearly as a possible cause, the [illegible] of fresh meat [illegible] special constituent [illegible] fresh meat. But against this theory [illegible] if my [illegible] the onset is correct (and I [illegible] all I have to rely on) [illegible] first symptom appeared within three [illegible] of my abstention from fresh meat. This seems too short a time to produce such a marked [illegible]. It must be remembered [illegible] when the [illegible] had [illegible].

[illegible] these facts point to [illegible] that beri-beri is [illegible] deficiency disease. The [illegible] may be [illegible] phosphates or other substance [illegible] for the production of the [illegible] whether the deficiency [illegible].

TREATMENT OF BURNS [illegible]

By Fleet S[illegible] C. H. GITTI[illegible]

For about five years [illegible] practice [illegible] has been for all scalds and [illegible] swabbed with tincture of iodine and then [illegible] aseptic dressing. They all did exceptionally well, and [illegible] an opportunity to apply this treatment on a larger scale. In order to afford an efficient control it was also necessary that two similar injuries should be present in the same subject. An opportunity occurred in May last year.

Scald of the Second Degree

An Able Seaman, aged 21. This man was carrying some recently made tea down a ladder when he slipped and scalded both thighs. On the right lower limb about two thirds of the outer surface of the thigh was scalded and there were some smaller scalded patches on the ankle. The cuticle was loose in parts but still in position. The cutis vera was exposed in a few areas only. Tincture of iodine was applied and the limb was then covered with a dressing of boracic wool. The thigh only of the left limb was damaged, and the extent was slightly less than on the right side. To this a first aid picric acid dressing was applied.

On the third day both limbs looked equally well. The serum present was evacuated from the blisters. Tincture of iodine was again applied to the right limb in the region of the evacuated blisters, and picric acid dressing to the left thigh.

On the sixth day the cuticle was now firm over most of the right thigh. Where serum from blisters had caused some maceration of the cuticle iodine was again applied. On the left thigh the cuticle was macerated and loose. Considerable areas of the cutis vera were bared. Boracic ointment was applied.

Thirteenth day. The right thigh was now practically healed. It was covered with the original cuticle, which was now firm and in places desquamating, showing a new pinkish cuticle beneath. The small areas, where the cuticle had been originally destroyed and the papillæ exposed, were covered with a hard dry scab. He could have gone to duty except for the condition of the left thigh. On the left thigh the papillæ were still bare and bled every time the dressing was changed.

The patient, who knew that I was experimenting on him, was so pleased with the result of the treatment of the right thigh that one evening he persuaded the sick berth steward to paint the left thigh with tincture of iodine and apply a dry dressing. I had been afraid to do it on account of the pain that might be caused; this however he said was [illegible] slight. The whole area scabbed over, and under this healing took place. He returned to duty ten days later on the twenty third day of illness.

The right thigh was unnecessarily disturbed, as I was anxious to see the effect of treatment. My routine now is to remove the dressing weekly [illegible] stains show in the outer layers of wool. Adherent portions are best loosened with tincture of iodine.

Treated with tincture of iodine, dusting powder and dry dressing, the more severely scalded thigh healed about ten days quicker than the other. Probably picric acid in alcohol would have been equally efficient,

[illegible] though [illegible] difficult to th[illegible] findings to w[illegible] Possibly it is sl[illegible] of boracic acid [illegible] to Service A[illegible] in the form of c[illegible] to rub boracic acid crystals into powder [illegible] is required and crystals can usually be [illegible] on board. Perhaps better results would be obtained [illegible] if crystals were supplied.

Remarks on Scalds of the Second Degree

Apart from the prevention of shock the desiderata in the treatment of scalds are:—

(a) The prevention of absorption of septic or other material.

(b) The provision of a dressing which is aseptic, is comfortable, and does not require frequent changing.

The application of picric acid to a broken surface is said, I believe, to cause the formation of a coagulated albumen layer, and thus absorption is prevented; but when the cuticle is still *in situ* it is difficult to understand what is the effect of a watery picric acid solution except to macerate and loosen the cuticle. Through the papillary layer being subsequently damaged, a burn of the second degree may be thereby converted into one of the third degree.

Deaths from burns in some instances are supposed to be caused by absorption of toxins from the destroyed epidermis.

Hardening by means of tincture of iodine of the cuticle which is dead but still *in situ* prevents absorption of septic material derived from without or from the cuticle itself, and provides a dressing which is aseptic, is comfortable, and does not require changing, i.e., the cuticle remains until it peels off about the fourteenth day. The previous application of a picric acid dressing need not interfere with the application of tincture of iodine, as I have used it on removal of a picric acid dressing which has been applied for twelve hours.

Scalds of the Third Degree

On account of the pain in a recent burn, when large areas are involved, tincture of iodine is not used, but a first-aid picric acid dressing is applied. After two days it is removed, and the surface is dusted with boracic powder. Since there is no necessity to remove the dressing to attend to the blisters formed, this dressing remains undisturbed for a week. Small scalds of the third degree are, however, treated like those of the second degree, as the pain is not unbearable.

A Leading Stoker, aged 27.—On February 1, 1915, whilst working at a dynamo, this man's left arm was scalded with boiling oil. Size of area 6 by 3 in. Cuticle destroyed and papillary layer affected. As he said that he could not stand any pain, first aid picric acid was applied.

Second day. At the end of thirty-six hours the dressing had become dry during the night. The picric acid dressing was removed, the wound was dusted with boracic powder, and boracic wool dressing applied.

Ninth day Dressing removed and scalds redressed as before Healing taking place under readily scabs varying in thickness

Sixteenth day Redressed

Twenty first day As there was some doubt about one scab a boracic compress was applied but the under surface was found to be healthy

Twenty fourth day Returned to work at his dynamo In the course of twenty four days treatment this man was only dressed four times

Remarks on Scalds of the Third Degree

In the case of a scald which comes for treatment when the cuticle is already removed, the application of the first aid picric dressing fulfils all the already laid down conditions to a certain extent Absorption is prevented by the coagulated albuminous layer formed, the dressing is aseptic the moistened lint makes a soft and comfortable dressing it does however require changing after two or three days when a dusting powder should be applied The retention of the dressing beyond this period has in my experience always delayed healing

If tincture of iodine dusting powder and wool are used as a first dressing there need be no disturbance of the wound for a week at least The pain caused by this has to be considered

In the treatment of scalds of the third degree there is need of a dusting powder which is antiseptic, analgesic, non toxic and easily removable Possibly a powder composed of boric or salicylic acid with orthoform or anaesthesin might meet these requirements, but of this I have as yet had no experience

Burns

In recent years I have had no cases of burns of the second degree of any size All small burns have been treated merely with sterilized cotton wool On the formation of blisters these have been opened aseptically after painting the skin with tincture of iodine The serum is then wiped away with tincture of iodine when the wound is dry, boracic powder is dusted over and a sterile cotton or boracic wool dressing applied This is changed weekly and even then usually only on account of external soiling

Burns of the Third Degree

About four years ago I was called to a Destroyer to see a man the victim of a bunker explosion The results of treatment with tincture of iodine however were inconclusive as he only remained under my care for about five days He was burnt from the nipple upwards including face and arms The burns were partly of the second and partly third degree When I arrived he had been covered with oil The right limb was treated with the first aid picric dressing and the other was painted with tincture of iodine There was very little shock When he left five days later the right limb was in parts covered with loosened cuticle sliding away from the cutis vera The other limb was dry with the cuticle in place Unfortunately the ship in which I was then serving had to leave harbour consequently he was landed and I lost sight of him

[illegible] ADRENAL TUBERCULOSIS WITH [illegible] ADRENAL INSUFFICIENCY

[illegible] SURGEON GENERAL H. D. ROLLESTON, M.D., [illegible]
[illegible] to the Royal Navy, Royal N[illegible]
Senior Physician, St. George's H[illegible]

AND

[illegible] SURGEON ROBERT S. LAWSON, M.A., M.B., [illegible]
[illegible]

[illegible] monograph "On the Constitutional and Local Effects of Disease of the Suprarenal Capsules" (1855) Addison [illegible] the singular dingy [illegible] discoloration of the skin as [illegible] mark of the [illegible] which is now called after [illegible] wrote that "[illegible] early period of the disorder [illegible] capsules are less extensively diseased, the discoloration [illegible] be so slight and equivocal as to render the source of the [illegible] uncertain. [illegible] does not appear to have recognized the [illegible] pigmentation. [illegible] Sergent is therefore justified in [illegible] without bronzing should not be called Addison's [illegible] pigmentation, but should be described as acute [illegible] adrenal insufficiency. The following case of latent [illegible] with subacute adrenal insufficiency presents some features [illegible]

A Leading Stoker, aged 31, but looking [illegible] Naval Hospital, [illegible] on January 11, [illegible] [illegible]

A CASE OF DERMOID CYST

By [illegible] Surgeon R. HUGHES, R.N.

The [illegible] t of a case of dermoid cyst that [illegible] [illegible] interest and may account [illegible] [illegible] examination in undefined abdominal [illegible].

An [illegible] had been suffering for the past [illegible] abdominal pain and obstinate attacks [illegible]. The pain was [illegible] felt in the right inguinal region [illegible] ally across the umbilical region and described by the patient as [illegible] caused by distension. He always suffered from these attacks when [illegible] or during a train journey. Then the attacks were associated with [illegible] tense desire to micturate and were relieved upon doing so [illegible] the erect posture.

Various forms of treatment had been prescribed for him, but with never more than partial and temporary benefit.

A few months previously an exhaustive X-ray examination after a bismuth meal had revealed slight dilatation of the ileum and the case was diagnosed as one of intestinal stasis.

I examined the abdomen carefully, with the assistance of several X-ray plates. I was about to inform him that I agreed with the diagnosis, and further recommend the treatment by massage, &c., when I realized I ought also to examine him *per rectum*.

Preparation for this examination revealed the presence of a cystic growth in the sacro-coccygeal region—soft in consistency and fluctuating. In the rectum a mass the size of a small melon could be felt pressing against the posterior wall of the bowel. Fluctuation could not be made out between the inner and outer surface of the tumour, and it could not be felt on deep palpation of the iliac fossæ. The case was discharged to Royal Naval Hospital, Chatham, where Mr. Turner, F.R.C.S., removed a large dermoid cyst through a transverse semilunar incision midway between the coccyx and the anus. The patient made an uninterrupted recovery and has not subsequently suffered from any symptoms of abdominal discomfort.

A SIMPLE METHOD OF TRANSPORTING COT CASES BY AMBULANCE TRAIN

By Surgeon A. VAVASOUR ELDER (Acting Staff Surgeon), R.N.V.R.

At the present time there are two methods in vogue of conveying lying-down cases by ambulance train: the fixed bed and movable cot. The fixed bed has been adopted for the military ambulance trains in this country and abroad, while the naval trains are fitted with interchangeable service cots which are simply suspended in the coaches during transit.

The fixed bed system has two great drawbacks:—

(1) Owing to the bed being rigidly fixed to the side of the coach it is at once a component part of it; consequently every jar and lateral movement of the coach is transmitted to the occupant. In fracture cases

[illegible] shell wounds the patient's suffering is greatly [illegible].

(2) With [illegible] fixed bed the patient has to be taken to and from the train [illegible] stretcher. Th[illegible] is a double transfer during conveyance to final [illegible] station. Here again avoidable pain may be caused. Furthermore [illegible] the case is too serious to be moved from the stretcher then the latter [illegible] be laid on the bed in the train and subjected to all jolts and jars [illegible] the journey.

[illegible] cot system is the best possible for naval service where a sufficiency [illegible] and a supply of clean cots are always available. For military [illegible] at the base and in the field these two requirements cannot [illegible] be met; therefore, the danger of septic cots debars this method [illegible] use.

[illegible] drawback to both systems is that a great deal of space is utilized [illegible] the number of cot cases carried. In other words too much [illegible] is given as the cots and fixed beds are in two tiers. Cases [illegible] severely wounded are quite content to remain in the recumbent [illegible] during transit. It is true that in the more recent military trains [illegible] have been arranged in three tiers, but being of the fixed type they [illegible] suffer from the drawbacks already mentioned.

A method has been tried which combines the advantages of both the [illegible] movable cot' and 'fixed bed' in addition to possessing some of its own.

Briefly it is as follows:—

From hooks in the roof of a coach and at suitable intervals apart four chains of requisite strength are hung. Each length of chain is broken into segments, so to speak, by the interposition, at proper spaces, of large blunt pointed, sickle shaped hooks. Each segment is attached to the most dependent portion of the hook above it and the final segment terminates in a hook.

Four hooks in all are required for each full length of chain and they are so spaced that the hooks in the four sets of chains are all on corresponding levels. The inner side of each hook is lined with a rubber pad [illegible].

The [illegible] bed [illegible] is composed of a rectangular frame of light tubular steel [illegible] by 1 ft. 9 in. across which a wire spring mattress is stretched in the [illegible] manner.

At each end of the frame are sliding bars which serve as carrying handles, being pushed inside the frame tube when not in use. The outer end of each sliding bar is curved upon itself rectangularly for 5 in., the curved portion acting as a 'leg' when the frame is placed upon the ground. The 'handles' or 'legs' are prevented from turning round by means of a pin which travels in a slot on the underside of the frame tube. The pin also limits extension of the handle (fig. 1).

The frame or bed is supported by placing it on to four hooks at corresponding levels. The hooks engage the frame laterally, one at each end, and the rubber pad acts as a cushion of some resiliency.

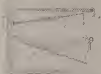
The bed is kept in position and prevented from any swinging or lateral movement by means of a 'gripe' which is hooked on to the centre of the frame on the 'gangway' side. The 'gripe' which passes underneath the bed consists of two pieces of light chain coupled by a spiral spring of requisite tension. The end of one chain is made fast to

[illegible] 1.—Frame [illegible] the long [illegible] foot

[illegible]

[illegible] the coach while the other [illegible] [illegible] hook which is rubber [illegible] [illegible] to fit the tubular frame [illegible] [illegible] into position

[illegible] is held in position [illegible] [illegible] to the side of the [illegible] [illegible] height. The [illegible] [illegible] the chain, link by link, as may [illegible] on the shaft of the "anchor [illegible] unhooked or when not in use. The [illegible] permits of adjustment of the "gripe" [illegible]



[illegible] for [illegible] [illegible] of coach [illegible]

The [illegible] lengths of soda rubber ½ in. in thick[illegible] horsehair mounted on a long [illegible] to the side of the coach. The consist[illegible] mean between rigidity and over resil[illegible] from the success of the fitting. This [illegible] upon the interaction of "gripe" and fender [illegible] jolts.

With the [illegible] fenders, the rubber lining of hooks and gripes, and the [illegible] also is made of metal which can be galvanized an[illegible]

A coach [illegible] downwards, commencing at the end of the coach [illegible] the door, and emptied in the reverse order. [illegible] patients are carried in three tiers, 2 ft. of [illegible] allowed to each. When occasion permits

bu[illegible] only [illegible] hooks [illegible] the [illegible] vertical.

[illegible] patient [illegible] only are [illegible] bed or cot, use [illegible] wall side of [illegible] partition. [illegible] segment on the "gangway" side supporting it is hooked [illegible] to the one above. The segments on the "wall side" are left hanging. If only two tiers are carried then the lower segments are hooked together to prevent rattling.

For the comfortable conveyance of fracture cases a special adjustment is required. Experience has shown that the spring of the wire mattress is too resilient while the train is in motion and the frame slats make the frame too rigid, consequently causing pain. This difficulty is got over by means of one or more slats of wood fitted with a blunt hook at one end and about 2 ft. of cord at the other. In use the slat is hooked on to the frame under the spring mattress on the "wall side" while the cord is passed round the frame on the "gangway side" and fastened. The tension of the slat is so adjusted as to produce a position of minimum discomfort to the patient by finding the mean between hyper-springiness and absolute rigidity. This point will vary in each individual case and well repays any trouble which may be experienced in finding it (see fig. 3, *f*).

If it is desired to retain patients on their stretchers, then the stretchers can be hooked on instead of the frame and kept in position by the "grips."

The advantages of this system may be summed up as follows:—

(1) The bed can be used as a stretcher for moving cases to and from the train. It will fit into any conveyance designed to carry a stretcher and thus patients can be sent direct to the hospital from the train, thereby saving at least one transfer. When transfer to a "landing" stretcher has to be effected, it is easily and safely done by placing the bed on the floor of the coach, the "end on" method of transfer being adopted.

(2) With the exception of "fondore" bedding, and rubber pads, all the fittings are of galvanized metal which can easily be cleansed and disinfected if need be. Further, the whole coach can be thoroughly cleansed as there are no fittings to retain dirt, &c.; only bedding may have to be changed.

(3) By means of the different segments of chain, cases can be carried in two or three tiers as may be required. Thus where a large number of seriously wounded patients who as a rule do not want to sit up has to be moved the carrying capacity of each coach can be at once increased by 50 per cent. above that of the normal ambulance train coach, which only carries two tiers. This is no small factor after engagements with heavy casualty lists.

(4) The fittings are inexpensive to provide and fit at the outset once a standard set has been made, also the weight is much less than that of fixed beds.

(5) The process of loading and unloading a coach is rapid, much more so than with fixed beds and about equal to that of the naval cot. Besides, for patients of average weight only two bearers are required.

(6) Ordinary stretchers can be carried in the coaches. In fact a train might be fitted up with one full set of stretchers and then simply carry

all stretchers brought to it giving its own in exchange. A circle would thus soon be established between the base hospital and out stations.

In this case however, owing to the extra length of the stretchers as compared with the designed "bed" and unless coaches sufficiently long enough to allow for this added length were obtainable, it would not be possible to carry all the stretchers in three tiers adjacent to each other, the handles would interlock. Therefore to obviate this the intermediate hooks would have to be used for adjoining stretchers, the handles overlapping each other. This would reduce the maximum capacity from 6 to 5, or an increase of only 25 per cent over normal as compared with 50 per cent (fig. 4).

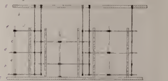


Fig. 4.—Diagram showing the disposition in case of [illegible] being loaded with [illegible] [illegible] The handle of the stretcher [illegible] [illegible] [illegible] [illegible] general [illegible] hooks [illegible] bed [illegible] body of coach [illegible] handle of stretcher.

It is understood that the suspension method was adopted by the War Office on ambulance trains during the South African War and subsequently dispensed with as being unsatisfactory. What the exact cause [illegible] was in these cases is not definitely known to the writer, but an [illegible] trial on the Naval Ambulance Train of the method above [illegible] has resulted in comfort to patients far in excess of that of a [illegible] bed or even a naval cot.

A BUOYANT JACKET FOR THE PREVENTION OF DEATH FROM SUBMERSION.

By Fleet Surgeon C. MARSH BEADNELL, R.N.

In the [illegible] of the year 1912, when serving in the Medical [illegible] H.M.S. [illegible] I made some experiments [illegible] life saving apparatus which, it was hoped, would be of [illegible] whose duties subjected them to the risks of submersion and [illegible]. The experiments were framed with a view to determine [illegible] buoyancy of individuals immersed in water and the [illegible] buoyancy requisite to neutralize the [illegible] and [illegible] sufficiently out of the water to enable the [illegible] to breathe comfortably and maintain himself in this [illegible] with the minimum expenditure of muscular energy. As a result of these experiments I took out a patent for a buoyant [illegible] jacket. This jacket has, it seems to me, certain [illegible] from the naval point of view over the [illegible].

(1) [illegible] it occupies less cubic space and [illegible] storage room than the cork apparatus.

(2) [illegible] fits the trunk closely, and so leaves the arms [illegible] work or for propelling oneself through the water.

(3) [illegible] worn over the clothes and be inflated by the [illegible] immersion is imminent, or should this occur [illegible] he is actually in the water.

(4) [illegible] it can be donned and doffed with ease and rapidity.

(5) [illegible] substance lining [illegible] apparatus would have [illegible] capacity for exceeding that of any cork or pith material.

(6) [illegible] apparatus would be lighter and more [illegible] than the [illegible] rigid life belts and life buoys, and would thus have less [illegible] to fatigue the wearer by its weight or through not adapting itself [illegible].

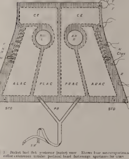
(7) [illegible] to a definite extent interfere with the rapid circulation [illegible] around and over the skin of the immersed individuals [illegible] specific [illegible] of its first [illegible] these [illegible] or other material. These [illegible] this [illegible] potential from excessive chill, the wearer [illegible] (some [illegible] upon the [illegible] blood pressure following the contraction of [illegible]) and shock. Being thus enabled [illegible] for a longer time, he would stand a better chance [illegible] picked up by rescue boats.

[illegible] the presence of [illegible] chambers the wearer of the jacket [illegible] upon the integrity of the [illegible] whole. Were one [illegible] to sustain damage, the [illegible] its original buoyancy.

[illegible] about 10 lb. and the weight [illegible] probably than 10 lb. [illegible]. It is conceivable [illegible] for use several struggling [illegible] too popular.

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] dis[illegible] [illegible] [illegible] [illegible] of rubber [illegible] be made [illegible]

[illegible] a brief description of the jacket An ordinary sleeve[illegible] [illegible] of some textile [illegible] like material It is made in two [illegible] [illegible] inner layer (that is to say the layer that corresponds



F[illegible] 1 Jacket laid flat posterior (outer) view Shows four air-compartments collar extensions nozzles perineal band fastenings apertures for arms

to the lining of an ordinary coat) and outer layer (corresponding to the coat proper) are fixed four distinct and separate distensible air compartments or bags made of, or lined with, rubber In my original experiments I used the bladders that are sold in grocers shops and in which lard is kept When the coat is donned two of these compartments are in front and two behind one on either side of the middle line

respectively. In the high ... figured L A C and R A C those behind, P L A C ... P R A C, anterior right or left, posterior right or left as the case ... Each of the posterior air compartments is continued up ... into the region of the neck there forming a half ... the right and left collar pieces in conjunction form ... the garment. This collar piece ensures the resultant of ... forces of the four

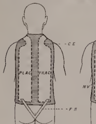


Fig. 2

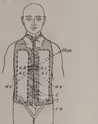


Fig. 3

Fig. 2.—... compartment and collar extension ... posterior compartment ... perineal band

Fig. 3.—... compartments and collar piece extensions ... of perineal band

air compartments being applied to the body as high up as possible so that the centre of gravity is below the centre of buoyancy and the immersed individual is not compelled to be constantly expending muscular energy to maintain an equilibrium that is compatible with breathing. To prevent the jacket ballooning up over the wearer's head as would inevitably happen with a loose fitting garment that was not fastened below a crucial shaped perineal band $P B$ is fitted. This band is passed

[illegible] by two straps [illegible] and [illegible] is worn by [illegible] to the [illegible] fixed to the [illegible] edge of the [illegible]

The [illegible] pneumatic [illegible] is fastened [illegible] passed through [illegible] parts can be inflated or deflated [illegible] inflation as already remarked [illegible] supplying successively the four nozzles [illegible] valves [illegible] to the mouth. The [illegible] upper and front part of the coat, two [illegible] posterior air compartment being [illegible] more [illegible] edge of the jacket. The nozzles when [illegible] by clips so as to be out of the way and [illegible] to become unscrewed and so allow of the escape [illegible]

I should [illegible] with regard to the collar part of the apparatus [illegible] this respect in view of the fact that a buoyant collar [illegible] all Service ratings during the war. My [illegible] considerable attention to the question during [illegible] collar alone is not of much practical value [illegible] The lifting—that is supporting—power [illegible] submerged is about 5 lb. Worn round the neck [illegible] floating, only about 50 per cent. of the [illegible] is effective as quite one half of the collar is out of [illegible] worn say, around the chest or under the arm [illegible] would be totally submerged [illegible] 5 lb upward thrust to the human body is not sufficient to keep the head out of the water. For all practical purposes the human frame is of much the same specific gravity as salt water, the average body being a little lighter in the ratio of about 990 to 1,000. The reader will remember that the density of a body is its weight in air divided by the loss of weight when weighed in fresh water. When we speak of the specific gravity of the human body we allude of course to the mean specific gravity of all its component parts from the light air and gases in the respiratory and alimentary tracts to the dense compact tissue of the bones. Relatively to the remainder of the body the head end is, unfortunately for the shipwrecked mariner, very heavy, so that there is always a tendency for this region to sink down below the water's surface though other regions may be well above. Hence it is that the cadaver, when floating, does so with the head completely submerged—the male with the face down, the female face up, owing to the relatively greater quantity of adipose tissue being anterior (pectoral region) in the latter, and posterior (gluteal region) in the former. Now the swimming efforts are naturally all directed to keeping the head end up, and a non-swimmer does not drown because he sinks but because the entrances to his respiratory passages get below water. The average human head weighs 10 lb., so that the minimum upward thrust applied by any buoyant apparatus to the submerged body must not be less than this amount if the head is to be kept out of water without special muscular effort directed to that end. The buoyant jacket under description would have a lifting capacity of 40 lb.

In view of the war afloat, and the inevitable loss of life at sea incidental to it, the present juncture may be an opportune one for a consideration of the merits or demerits of this suggested life-saving jacket. The patent for the taking out of which I obtained Admiralty sanction at the beginning of 1912, has now lapsed, but the agents write me to say it is still renewable.

A LIQUID RHEOSTAT WITH PARTICULAR REFERENCE TO ITS USE IN IONIC MEDICATION BY MEANS OF ELECTRIC CURRENTS OF LOW VOLTAGE

By Lieutenant B. L. L. Maton, R.N.

The following notes on the subject of a rheostat which has been in successful operation in H.M.S. "Southampton" during 1913 and 1914,[1] and previously in certain other places, have been compiled from the electrical rather than the medical point of view. It is hoped that they may be of interest and possibly of some small value.

The rheostat is of a liquid type and such that, with any given electrolyte, the measure of its ohmic resistance is a function which is made to vary inversely as some factor of the submerged area of the electrodes. For various reasons currents of a low voltage only have been considered in these notes and no reference has been made to those of the order commonly called "high frequency." The apparatus described has been found in practice to be particularly easy to manipulate; indeed the control of the current depends merely on the opening and closing of a two way tap.

It is well known that in any electrical circuit in which the current is regulated by means of resistances or rheostats of the "step" type, that is to say, where a certain amount of resistance is cut out or introduced by the movement of a contact from one position to another—there must be a somewhat abrupt increase or decrease in the current at each such operation.

However finely subdivided this latter type of rheostat may be, the "kick" in the current strength due to even moderately sudden variations of resistance cannot be altogether eliminated, although it may be rendered less and less perceptible in proportion as the number of "steps" is increased and the intervals between them correspondingly decreased.

Where the human body is concerned, as in the case of ionic medication, this kick can nearly always be felt with even the most delicate resistances, particularly when the current is increasing. To many patients this sensation is very objectionable and frequently it may be distinctly painful; on the other hand, even those who are, or imagine that they are, most sensitive to "shocks" will hardly be aware of any increase in the current strength during the period of its application, provided that the

[1] In his official report the Medical Officer of the "Southampton" (Staff Surgeon Alexander MacLeay, M.B.) comments very favourably on Lieutenant Maton's rheostat in ionic medication.—[Ed.]

resistance which controls it is reduced by gradations of infinitesimal magnitude.

In other words the graph which represents "current strength" must be a smooth curve and not a zigzag succession of steps.

In the following diagram the zig-zag line is a characteristic graph drawn to represent the relation between time and rate of flow of current when that current has been controlled by a rheostat provided with the ordinary step by step sliding, or screw contact, or by some other regulating device of that nature, the result obtained with the type of rheostat described in these notes is shown by the curved graph.

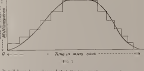


FIG. 1.

It will have been observed that the two graphs represent approximately equal electro-chemical effects, since they enclose approximately equal areas, while the action has been spread over the same interval of time in both cases. Assuming however that both the zigzag and the curved graphs represent the records of the electro-chemical action in two cases of ionic medication, it will be understood that the zigzag graph affords in addition, a clear indication of both the number and the relative degrees of intensity of the gratuitous nerve sensations administered to the patient—twinges of pain which marked the progress of the treatment.

The current applied in ionic medication is usually only a question of milliamperes, and the resistance if of the usual pattern must be very finely subdivided if satisfactory results are to be obtained. With a liquid resistance of the type to be described, however a perfectly steady increase or decrease in the current can be obtained without any liability to kicks. The cost moreover of such a rheostat is very small compared with that of the elaborate articles usually offered for sale to the medical faculty by most manufacturers of electro-therapeutic apparatus.

General Description of Apparatus

The apparatus is mounted on a board for fixing to a wall or bulkhead although it can be adapted equally well for use on a table. It has two main parts, the switchboard and the rheostat.

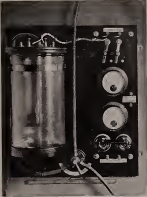


Fig. 2.—General arrangement of apparatus.

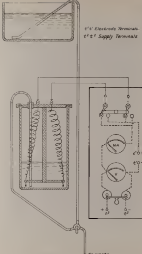


FIG. 3.—Diagram of the switchboard, rheostat and tank, showing electrical connections

The *Switchboard* is an ebonite panel with the following fittings on it —

(a) *Voltmeter* (0-30 v) showing the voltage of the current at the supply terminals connected with the main or other source of electrical energy

(b) *Milliammeter* (0-30 ma) showing the flow of current in milliampères between the electrode terminals i e, through the patient

(c) *Double pole tumbler switch* for making or breaking connection between the supply terminals and the apparatus

(d) *Double pole change over switch* for reversing the polarity of the rheostat electrodes, the reason for the provision of which will be apparent later

The *Rheostat* consists of a glass jar and a wooden cover to the centre of which is fixed a wooden spindle carrying at the lower end an ebonite spreader, suitably formed for clamping the wire electrodes These electrodes consist of helical coils of silver wire, secured between the cover and the ebonite spreader, as far apart as possible at their lower ends, these coils are connected to the rheostat terminals on the switchboard

A glass tube is fixed in the cover and passes down to the bottom of the jar through a support at its lower end The top end of the tube is bent down and, by means of lengths of rubber tubing, leading to a two way tap, can communicate either with a supply reservoir situated above the glass jar or with a waste pipe

Action —When the external parts of the circuit are complete the tap is put over to "Fill" this allows water to run down from the reservoir into the jar via the glass pipe As soon as the ends of the wires become immersed in the water, the current is able to start flowing through the circuit which has now been completed by the introduction of a high resistance As the water rises in the jar increasing the area of the submerged electrodes, the resistance is gradually diminished When the required strength of current has been reached the tap is centred, shutting off the supply of water

When the treatment is finished the tap is put over to "Empty" the water then syphons out of the jar through the waste pipe The current is therefore gradually decreased until it is finally broken as the ends of the wire clear the surface of the water

By this means a perfectly steady increase and decrease in the current has been obtained the rate of this increase or decrease can be regulated as required by the speed at which the water is allowed to fill or empty the jar

Notes on the Rheostat

Various metals have been tried for the wires which form the electrodes in order to avoid the erosion due to electrolytic action The best metal would of course, be platinum, but the price makes this somewhat prohibitive silver wire is cheap and a very good substitute

Erosion takes place chiefly at the lower extremities of the wires and more so on the positive than on the negative For this reason the double pole change over switch has been introduced so that the polarity of the wires can be changed without trouble when required but this must never be done during an application, as the patient would be subjected to a violent kick of the current

The clamping arrangement for the lower ends of the wires has been

Fig. 11. — ...stat cover showing the electrodes, spreader, &c.

so arranged that when the ends of the wires are [illegible] corrosion they can be easily unclamped the worn [illegible] wire reclamped where it is still in good condition [illegible] wires should be allowed to project below the botto[illegible]

Owing to the "surface tension" of liquids it will [illegible] ends of the electrode wires will press down the surfa[illegible] when the tension has been overcome the water sud[illegible] the wires for a distance of perhaps something less than [illegible] inch, but it usually sufficiently far to cause about a half mill[illegible] the current on starting. To overcome this various meth[illegible] with success such as covering the ends of the w[illegible] celluloid varnish (celluloid dissolved in amyl acetate) [illegible] the two latter were found to require somewh[illegible] simplest method, and the best appears to be th[illegible] namely a piece of bicycle valve tubing slipped over the [illegible] which is doubled up inside the tubing so as to keep it secure. Although only one electrode need be so treated it is advisable to app[illegible] similar covering to both.

The lower ends of the coils of wire should be straight the number of turns per inch and their diameter should increase towards the top. This allows of a comparatively slow rate of increase in the current on starting when it is usually more likely to be felt by the patient while a more rapid increase is obtainable afterwards if a heavier current is required.

When this rheostat is used on board ship it should be set up with the rheostat electrodes lying in the fore and aft line if each consists of only one coil of wire. Then any rolling of the ship will be less likely to cause variations in the rheostat.

As ordinarily arranged for ionic medication each electrode consists of a single strand of wire. Metal strips or plates however may equally well be used if necessary, or alternatively the electrodes may be made of multiple wires so arranged that either one wire only may be used or so that two or more wires may be combined together to form an electrode. These and other such variations must depend on the nature of the circuit which the rheostat is to control.

The spreader is usually made of ebonite and in the form of a cross piece with clamps at its extremities for holding the electrodes. Where however multiple wire electrodes are contemplated a more convenient form for the spreader is that of a disc with circumferential wire grips, such a disc should be adapted to act as a support to the lower end of the glass tube, and all superfluous material should be removed by boring holes &c.

This apparatus has generally been worked off the low power (30 volts) ships circuit, although the supply from the main circuit (110 volts) has also been used when the external electrodes applied to the patient have covered a large area and a correspondingly larger current has been necessary.

If it is required to use the rheostat as described on a higher voltage than 30 volts the voltmeter must be disconnected first as that is the maximum voltage for which it is arranged, unless an external resistance is introduced to bring down the voltage of supply.

Ordinary tap water has been found suitable for this apparatus, but it

Fig. 5.—The Sematahm

will be recognized that the specific [illegible] of the electrolyte may be varied at will by acidulation &c.

Experience would seem to [illegible] that the effect of the polarization of the rheostat electrodes such [illegible] entirely ignored in no case of ionic medication has it yet appeared to be appreciable. Although, in point of fact polarization must tend to increase the resistance of the rheostat there is usually a gradual decrease in the ohmic resistance of the patient, due to various causes as the treatment proceeds. While it is generally impracticable and unnecessary to determine the measure of these two effects it is probable that they balance one another approximately in respect of both amplitude and rate.

The Somatohm.

When arranging or testing apparatus for ionic medication it is often convenient to be able to substitute for the patient some inanimate object which has approximately the same ohmic resistance as the human body or that part of it through which the current will flow during the progress of the treatment. For this purpose the somatohm (σῶμα a body) has been designed. It represents a form of resistance which is simple cheap and constant in effect within reasonable limits yet capable of some variation over a moderate range of resistance.

The following has been found to be a fairly suitable specification:—

Through each of the corks of the two outside necks of a 10 oz three neck Woulfe wash bottle is fitted a ½ in glass tube of about 8 in length. Down each of these tubes is passed a ⅛ in copper wire electrode each of which is about 12 in long and fitted with a connector for the electric lead at its upper end and with an adjustable clamp a little lower down to take against the top of the glass tube. The wash bottle should be nearly filled with water.

It has been found that in order to pass a current of about 10 m a with about 15 volts at the supply terminals and the rheostat about two thirds full the clamps should be so adjusted as to allow the electrodes to project about ¾ in below the lower ends of the glass tubes provided that the distance between these ends is about 2 in, as in the case of a 10 oz bottle in which the electrodes are fitted in the outside necks.

The range of action of the somatohm may be altered by varying the electrolyte, by adjusting the height of the glass tubes and the length of the exposed parts of the electrodes by fitting electrodes of various designs or by fitting them through two necks which are close together &c.

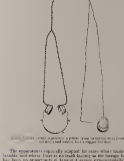
A BULLET TELEPHONE APPARATUS

By Fleet Surgeon E. G. E. OLLARY F.R.C.S.Edin R.N.

This bullet telephone apparatus is of simple design, is practical and could be constructed without difficulty on board any ship carrying a wireless installation.

It consists of a wireless operator's receiver fitted with a double vulcanite earpiece and metal spring retaining it in position, to each earpiece

a ... each end being secured by a screw ... at convenient distance. It is again unravelled into two free ends having on one a circular disc 3 in in diameter composed of thin copper foil backed by tin foil, the bared copper wire being placed between the two. On the other free end a surgical needle is encircled by the copper wire of the lead and is of sufficient length to penetrate the tissues, without incision if necessary and impinge on the bullet or portion of shell. The foreign body would probably have to be localized roughly by X rays beforehand; the metal disc covered by cotton wool soaked in saline solution should rest against the part under examination.



... corner represents a potato lying on cotton wool (soaked in salt solution) and behind this a copper foil disc

The apparatus is especially adapted for cases where localization is not feasible and where there is no track leading to the foreign body. There has been no opportunity of testing it except experimentally with a fresh unpeeled potato. It was found that, with the potato resting on the saline solution and the disc, a "ring" could be heard as the needle was

drawn across its surface or better by a series of short sharp stabs made into its substance caused apparently by a current being set up by vegetable acids and the opposing metals of the needle and the disc. If a foreign body is embedded in the potato, of course a much clearer ring can be heard

I am much indebted to Lieutenant C E Tooth, R N, for his valuable assistance in the construction of the apparatus

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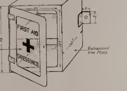
A GALVANIZED IRON CUPBOARD FOR FIRST AID DRESSINGS AS A PERMANENT FITTING IN TURRETS AND CASEMATES

By Fleet Surgeon G E MACLEOD, R.N

As the present system of providing the turrets and casemates of H M ships with first aid dressings contained in canvas bags is open to many objections and decidedly unsatisfactory in time of war it is thought that a galvanized iron cupboard (on the lines of the one shown in the sketch) should be provided for this purpose as a permanent fitting in each of these fighting positions



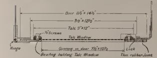
The advantages claimed for this cupboard are —

(1) The dressings would remain permanently in the turret (or casemate) in a conspicuous position and be ready for instant use

(2) Repeated coaling (and subsequent washing down) would not necessitate their frequent removal and replacement as it does at present

[illegible], with the bags and interference with (or loss of) their [illegible] would be avoided

(3) [illegible] of the bags and contamination of the dressings by [illegible] water, coal [illegible], could not occur



SECTION THRO' FRONT

The sketch explains itself. It may be pointed out, however, that the cupboard is of modest dimensions and no larger than the existing [illegible] tank.

Two points of note are —

(a) The talc window which enables the contents to be plainly seen, and can be easily broken in case of emergency

(b) The thin rubber joint to the door which renders the latter dust proof and water tight

Reviews.

[illegible] By Edmonde Delorme, Médecin Inspecteur [illegible] Ancien Président du Comité Consultatif de [illegible] Membre de l'Académie de Médecine, Membre et [illegible] de la Société de Chirurgie. Translated by H. De M[illegible] [illegible] to In-Patients French Hospital, London. London: [illegible] 1915. Pp. viii + 248. Price [illegible] net.

A [illegible] this subject from the pen of so distinguished a surgeon who has had such a wide experience of military surgery both in the Balkan Campaign of 1912 and in this War, will command our respect and will be heartily welcome at the present time.

In the preface the author states that the book is intended both for [illegible] and also for those surgeons whose everyday practice—after specialized—has not allowed them to follow the advances made in military surgery.

The opening chapters deal with the weapons used in modern warfare, projectiles, ballistic data concerning bullets and shells, and the modus operandi of bullets. The damaging power of the German, Austrian and French bullets, i.e., the German S, the Austrian Mannlicher, and the French D bullets, is shown to be practically the same to 2,000 metres; it is very great at 100 metres, considerable to 500, decreases rapidly from 500 to 1,000, and is very small between 1,000 and 2,000 metres. We note that injuries inflicted by ricochetting bullets are observed in the proportion of one in three of all cases. A projectile ricochetting from the ground is deflected and strikes the body obliquely or transversely; it is put out of shape, flattened, broken up, or separated from its envelope, so that the number of injuries is multiplied. S and D bullets when penetrating in the normal manner make a puncture-like opening, and do not carry with them, to any great extent, foreign bodies from the clothes, but when they have turned over or ricochetted, they have a tearing and bruising effect, and carry with them foreign bodies from the clothes.

The term "humanitarian," as applied to the modern bullets, is quickly disposed of: their pointed form and small diameter are counteracted by the frequency of their turning over, and they cause a considerable immediate mortality, fatal injuries according to Tourneo being in the ratio of 25 per cent, serious injuries 15 per cent, and slight injuries 60 per cent. The distance between combatants tends to decrease, and firing is carried on in zones in which the bullets acquire an excessive active force (*vis viva*) producing wounds amongst the most dangerous known and of *appalling mortality*. Round bullets from shrapnel inflict in general, slight injuries such as contusions or incomplete perforations, though often complicated by the presence of foreign bodies from the clothes. The high explosive shell usually breaks up into small, thin, striated, and sharp lamellæ which sometimes become imbedded in the body as if they had been sown like seed.

In Chapter III on "Wounds of Different Tissues" (injuries of the

soft parts) it is stated that very large and extensive wounds that are lacerated, bruised, very dirty, and result from large fragments of shell *are hopelessly doomed to suppuration*. The new model dressing-packet carried by the French soldier is here described. The cover is of strong waterproof Japanese paper and is opened by pulling on a small linen tape which projects from one corner. It contains two dressings each consisting of a pad of hydrophylous cotton wool enveloped in gauze; one dressing is sewn to a linen bandage, while the other is movable, and slides along the bandage by means of two tapes. The second dressing has been sterilized by the autoclave and no antiseptics are used. To ensure against contamination a red cross and a black cross surrounded by a circle show where the dressing should be taken up, one sign for the right hand and one for the left. On one corner of the movable dressing is a red tag by which the dressing is held.

The author favours tincture of iodine as the best and safest disinfectant both in the fighting line and at the rear, but elsewhere alludes to most of the common antiseptics and hydrogen peroxide in their proper spheres. If dressings containing bichloride of mercury or carbolic acid are used after application of iodine, cutaneous irritation may appear, but this may be avoided by first applying underneath such dressings a square of folded gauze.

Chapters follow, on wounds of arteries, wounds of nerves, foreign bodies, bony lesions of the diaphyses, lesions of the articulations, general complications of wounds, wounds by large projectiles and their fragments, amputation, and the remaining ten chapters of the book are allotted to wounds of various regions. In traumatisms of nerves operative treatment should not be undertaken early or until Nature shows incapacity to undertake repair. M. Gnoco's method of ensheathing, by making use of a portion of a large superficial vein taken from the patient, is mentioned.

Lesions of the diaphyses occur in the proportion of one fifth of all wounds. The writer remarks: "There is no traumatism that brings into such strong relief the striking differences separating war surgery from ordinary surgery." [illegible] Delorme's valvular metallic gutter splints for fracture of the diaphyses and for articular lesions of the upper and lower limbs are now supplied to all the French ambulances, and are shown by an illustration; these splints take up little room, are easily moulded to the limbs, serve equally for either limb, can be applied rapidly, and owing to their valves they render very easy both the supervision of the limb and the application of dressings.

In the treatment of confirmed tetanus it is stated that subcutaneous or spinal antitetanic serotherapy has not given convincing results. Spinal injections of from 2 to 6 c.c. of a solution of sulphate of magnesium (25 in 100) daily for five or six days, are sedative, and a combination of these injections with others of serum in large doses has been recommended. In emphysematous gangrene, in addition to free incisions and extensive irrigation with hydrogen peroxide, a double circle of hypodermic injections of hydrogen peroxide should be administered at the point where the oedema and the gaseous crepitation is arrested: half a syringeful are injected morning and evening or several times in the day, 20 or 30 for the leg and 30 or 40 for the thigh.

On penetrating wounds of the abdomen the character of intestinal lesions particularly in regard to the range is alluded to. (1) At a greater

distances of 800 metres the present bullets will generally leave very small perforations which might almost be called simple punctures. They have a great tendency to close up spontaneously (Ferraton). (2) At a smaller distance than 100 metres or when the bullet has struck obliquely and has undergone a deviation before reaching the intestine, or when the projectile is a shrapnel bullet and *a fortiori* a shell fragment, the intestinal orifices are like the cutaneous orifices but less likely to be closed by mucous membrane. At very short distances explosive effects are seen, bursting of the intestine and large gaping wounds. The treatment of penetrating wounds of the abdomen is at present expectant. As *a principle* immediate laparotomy should be rejected, the most recent wars—Transvaal, Manchuria, Balkans—having shown its harmfulness. The author hopes that the present war will bring to light a treatment more unvarying, more susceptible of generalization, better adapted to circumstances and the great variety of the lesions, and which will contribute to lower a mortality that is still excessive.

The book contains much authoritative information and many valuable hints. The style is terse though graphic, and in this respect will appeal to those who now may have few moments of leisure. The translator, well known as a surgeon and as the author of "Dictionnaire des Termes de Médecine Français-Anglais," has performed his part very ably. He remarks that he has endeavoured so far as possible to keep closely to the French text. The type is clear and the publishers have produced a very compact and handy volume. We feel confident that our readers will derive great pleasure and value from its perusal. W. L. M.

EMERGENCIES IN MEDICAL PRACTICE. By Sanitaetsrat, Dr. Richard Lenzmann, Head Physician of the Diakonenkrankenhaus of Duisburg. Translated from the Third Edition by Ronald E. S. Krohn, M.D. Lond. London: John Bale, Sons and Danielsson, Ltd. 1915. Pp. 577. Price 21s. net.

Every Naval Medical Officer is liable to be constantly confronted with sudden emergencies which he is called upon to deal with either wholly unaided or assisted by the advice of a comparatively inexperienced colleague. This book should therefore prove of great value to officers of our Service. It must be said that the title is a little misleading, as it gives the impression of a small *vade mecum* concerned only with the emergencies arising in a medical as distinguished from a surgical practice. As a matter of fact the bulk of the work is too great for such a minor purpose, and it embraces the study of all morbid conditions suddenly endangering life, whether those conditions are related to surgery, medicine or midwifery. The book is arranged in seven sections, each of which deals respectively with brain and nervous system, respiratory apparatus, circulatory apparatus, digestive tract, urogenital system, pregnancy, labour and childbed, and lastly poisoning. In the case of each emergency symptoms, diagnosis, prognosis and treatment are methodically discussed. The author, when describing treatment, shows first what the aim of the practitioner should be, and then gives the methods by which his purpose may be effected. Practical details are carefully worked out. The sudden loss of consciousness which may occur in the various forms of cerebral syphilis is very fully dealt with, and as examples some interesting

... quoted, particularly that of a missed diagnosis of chancre ... ten years after by cerebral syphilitic arteritis. Indeed, many ... points made throughout the book are illustrated by graphic accounts ... cases. Nor does the author restrict himself by any means to the relation of successful cases only. Thus the reader is shown how to profit by the mistakes of others.

The subject of tetanus receives ample attention. That portion of the book which covers the differential diagnosis, prognosis and treatment of the various forms of hæmoptysis is to be particularly commended. In the emergencies arising from diphtheria the author, in order that as rapid ... action of Behring's serum as possible may be obtained, administers it intravenously in doses of not less than 1 500 units to the smallest children. Older children and adults require from 3 000 to 5 000 units, but no intravenous injection should ever be given to a patient who has for any reason whatever received a previous injection of serum. Intubation is considered too risky to be employed in private practice and it will probably always remain a speciality for children's hospitals. Every medical man should be prepared to undertake tracheotomy at any time of the day or night, although serum therapy has considerably reduced the number of cases in which the operation becomes necessary. As an example of the author's attention to practical details he devotes twenty pages to the technique of this operation and the after treatment. The acute dyspnœa of capillary bronchitis is treated with emetics and a mustard pack, minute details of which are given. In the section on œdema of the lung, it is curious to note that no mention is made of aspiration of a pleural effusion as a cause of this phenomenon. Perhaps the most interesting parts of the book are the discussions on the diagnosis, management and treatment of emergencies arising in connection with the intestinal and genito urinary tract.

In the Section on Poisoning the writer discourses at great length on "Serum Sickness" and illustrates his warnings with regard to dosage and frequency of administration by several apt clinical cases in point. The few pages devoted to food poisoning offer much useful information. Under the heading of "Irreparable Cases" one is disappointed to find no mention of chlorine, although the author is a German. In spite of the Teutonic origin of this work we believe that he who masters its contents will find enjoyment in the process and often be glad of the help thus secured. As the copyright has long ago been sold, neither the author nor any other enemy benefits by the sale of this book. R. C. M.

Amœbiasis and the Dysenteries. By Llewellyn Powell Phillips, M.A., M.D., B.C.Cantab., F.R.C.P., F.R.C.S., Professor of Medicine, Egyptian Government School of Medicine, Cairo. London: H. K. Lewis. 1915. Pp. 147. Price 6s. 6d. net.

This interesting book, as the author states, has been hurried through the press for the purpose of providing up to date information on these conditions which are likely to be of increasing frequency as the present war continues, and for that reason plates which would have been most useful have been omitted. The first seventy four pages are devoted to amœbic dysentery or what is more comprehensively described as amœbiasis, including infections of the liver, lungs, brain, spleen, as well

as those of the bowel The recent [illegible] is particularly referred to in differentiating [illegible] the importance of detecting "carriers" [illegible] encysted amoeba of the tetragena form [illegible] two real types, *Entamoeba coli* non pathogenic [illegible] pathogenic form which so varies in [illegible] described as *E tetragena* and *E* [illegible] examination of dysenteric stools is of [illegible] diagnosis and should be carefully carried out [illegible] for dysentery itself and liver abscess is [illegible] recognized that this drug does not act on [illegible] it requires to be given for prolonged periods [illegible] A short account is given of dysenteries [illegible] various forms of flagellates as *Lamblia* and [illegible] bacillary dysentery is dealt with in [illegible] its importance The causative organisms [illegible] four well recognized forms the Shiga Kruse Flexner [illegible] and His Y bacillus These again fall into two groups [illegible] mannite fermenters which are markedly toxic (Shiga Kruse) and [illegible] to ferment [illegible] which are only slightly toxic For the [illegible] bacillary dysentery the great value of the anti sera is clearly [illegible] The author has a very large practical knowledge of the subject from his experiences in Egypt has compiled a book which is [illegible] supplying as was his wish a valuable aid to the recognition and treatment of one of the most distressing conditions [illegible] in the near East and so frequently associated with war conditions It can be thoroughly recommended In future editions a few plates would greatly add to its value

P W B S

A COMPENDIUM OF THE PHARMACOPŒIAS By C J S Thompson Fifth Edition London John Bale, Sons and Danielsson Ltd 1915 Pp 398 Price 5s net

This is a handy pocket book of reference for Medical Practitioners Pharmacists and Students In the first seventeen pages are found in alphabetical order a list of modern drugs their solubilities properties and doses a convenient arrangement for those who wish to keep pace with the present day tendency among patients in the higher walks of life to look upon any and every new remedy as being inherently superior to the old but well tried medicines Next comes a synopsis of formulæ of the new British Pharmacopœia with the drugs again arranged in alphabetical order It is quite likely that Naval medical men in unfrequented paths of the sea may find this section of great help in compounding remedies their stock of which has been expended Thereafter follow synopses of the various Indian, Colonial and Foreign Pharmacopœias These are of merely academical interest to us The section which contains a number of the most useful prescriptions from the British Pharmaceutical Codex and Hospital Pharmacopœias will probably prove very helpful to young practitioners The importance of the preparation of food for invalids is recognized in a section which deals wholly with this subject The period of quarantine in infectious diseases hardly comes within the scope of pharmacy, but the fact that it receives attention shows that the author

intends that the [illegible] general unless A large portion of the volume is devoted [illegible] alphabetical index of diseases with appropriate medicinal remedies [illegible] Amongst other useful information is an account of the effects [illegible] certain drugs on the skin urine and faeces Analysis of urine is fully dealt with Poisons, their antidotes and treatment are arranged in tabular form An alphabetical list of incompatible chemicals and drugs completes a very useful little volume, which can easily be carried in the pocket We have no hesitation in recommending it R C M

THE MEDICAL ANNUAL, 1915 Bristol John Wright and Sons, Ltd London Simpkin, Marshall Hamilton Kent and Co Ltd Pp 1 816 With 71 plates and 149 figures Price 10s net

This popular work maintains its high standard of efficiency, and gives in a short space the chief advances in treatment for both medical and surgical cases This year it has increased by thirty pages and includes, for the first time, three articles on Naval and Military surgery The first is by Deputy Surgeon General A G Wildey R N This is based mostly upon experiences of recent wars in the Far East, and contains much interesting information useful at the present time He draws attention to the fact that on the word Mobilize for War a perfect system of machinery was set in motion which provided at once and without a hitch every requisite of equipment both personal and material for the ships and hospitals of the Royal Navy The second article by Colonel L A La Garde United States Army (retired) on Military surgery treats chiefly of injuries caused by projectiles and is well illustrated The third by Mr G L Cheatle, Consulting Surgeon, Royal Naval Hospital Haslar is on "Antiseptics in War and the Method of their Application" He is strongly in favour of perchloride of mercury with malachite green as being the best antiseptic obtainable and considers that it is most satisfactorily applied to recent wounds in war by means of a spray apparatus He mentions some work on the subject which is being carried out in conjunction with others but is not yet completed. Considering the size of the book the illustrations are particularly good and plentiful the coloured plates of skin diseases being excellent The work is invaluable to those wishing to keep pace with modern theory and practice, and should be carefully read P W B S

MALAY POISONS AND CHARM CURES By John D Gimlette, M R C S, L R C P Residency Surgeon of Kelantan, one of the protected Malay States London J and A Churchill 1915 Pp viii and 127 Price 3s 6d net

Eighteen years service in the Government of the Federated Malay States has afforded the writer opportunity to compile this interesting work on a subject which presents a large field for medical research but of which little is generally known The main portion of the book is devoted to Malay poisons and medicines of which complete information as regards their natural history botany, and chemistry is given

The methods of the 'medicine man of Malay or *bomor* in which magic and charms play the principal part, are described in the first chapter The 'medicine man seems to have anticipated in some way

the belief of Christian Scientists, and holds that when the thought of man is fixed upon a disease with persistency that disease becomes more powerful. It is said that an accomplished Malay criminal can give a single dose of poison and time the death of his victim for varying periods up to three years but the author has observed no case to prove this statement; a similar old time tradition still exists in many primitive countries.

The chapters on certain poisonous fishes and on jungle and village plants are of particular interest. Many of the poisons mentioned would appear to act chiefly as mechanical irritants, for instance bamboo hairs, the bristles of hairy caterpillars, bristles of the seaworm and fish spines, though some also may have inherent poisonous properties.

The reader will derive from this book many useful hints as to what to avoid in a tropical country. It is a valuable addition to the scientific literature relating to the Malay States. W. L. M.

A Short Course of Physical Training. By Allan Broman. London: John Bale, Sons and Danielsson Ltd. 1915. Pp 18. Price 1s 6d net.

This little handbook is the outcome of a general demand on the part of those engaged in instruction and those under training in the new Armies for a short explanatory treatise with a few tables that would serve men who are without the advantage of the training given at the Headquarters gymnasia, but who nevertheless have to undertake the instruction of territorial and other units. Each group of exercises is accompanied by a short explanation of its particular purpose and effect in developing the body and correcting faulty carriage and gait.

Naval officers employed in physical training duties will find much that is interesting and useful in this book. R. C. M.

Abstracts and Translations.

[illegible] (C.) Blanc (G.) and Conseil (E.) Recherches expérimentales [illegible] typhus exanthématique pratiquées à l'Institut Pasteur de [illegible] 1914 à 1915, *Arch. de l'Institut Pasteur de Tunis*, [illegible] No. [illegible] 1914.

[illegible] state that the prophylactic measures based upon the [illegible] rôle of transmission of typhus by the louse have [illegible] the disease in Tunis, where it was always endemic. [illegible] carried out in the Pasteur Institute of Tunis, [illegible] that (1) lice fed upon an infected monkey were virulent [illegible] days after their last feed when broken up and injected into [illegible] cavity of monkeys or guinea pigs; (2) the excreta of the [illegible] infective for the same period; (3) the infectivity of the louse is not [illegible] mitted to its next generation; (4) bacterial forms described by [illegible] were found as frequently in lice fed on healthy people as in those [illegible] on typhus patients; (5) attempts to obtain a filtrable virus for typhus was unsuccessful; (6) the spleen of infected animals is virulent but not more so than the blood; (7) dogs, cats and rabbits are not susceptible to the typhus infection.

P. W. B. S.

Thoinot. Le Typhus exanthématique. *Ann. d'Hyg. pub. et de Méd. légal*, January 1915.

Letulle (M.). Mesures prophylactique contre le typhus exanthématique. *Rev. d'Hyg. police sanit.* January 1915.

An outbreak of typhus is possible among the expeditionary forces introduced by either European, African or Asiatic infection. As a disease its appearance has always been found in association with crowding together of individuals who are generally physiologically debilitated and under war conditions. By the researches of Nicolle, Anderson, Goldberger, Sergent, and others the etiology of the disease has been to a great extent cleared up and therefore prophylactic measures can be carried out on more scientific lines. It is, of course, important to know the clinical signs and symptoms of the disease and its sequelæ which are rarely seen by ordinary medical officers, and secondly, it is important to remove all conditions of bad sanitation known to favour the spread of filth diseases. It is especially necessary to destroy all lice present, either on the body or in the clothes, as these are now definitely recognized as being the chief agent in transmitting typhus. In the latter paper, the methods of dealing with the clothes of the patient and of himself if invested with the parasites is very fully described: heating and sulphurization of the clothes, shaving and washing the body, and the application of xylol, benzine, or mercurial ointments. He notes that men employed on the dangerous disinfectant work of these cases should be specially selected, well paid, and provided with an efficient costume from head to foot. The instructions to them are to cut the hair, beard, &c., and any lice if

present, use the parasitic applications, remove the clothes rapidly, wash the body, prepare the clothes for disinfection, and then place them in the sulphur chamber. P. W. B. S.

HORT (E. C.). Typhus Fever. *Brit. Med. Journ.*, April, 1915. Pp. 673-675.

In this interesting paper the chief features of the disease as we know it to-day are given. The frequency with which lice and lousy clothes are associated with the cases is pointed out, but the author from his researches concludes that lice are not the only "carriers" of the infective agent; the urine and excreta contain a filtrable virus able to produce the disease.

There is no doubt that the blood during the first five days contains an infective organism which can produce disease in man and in monkeys and that lice can act as intermediary hosts. A great number of organisms have been described as the causative agent, but those most frequently found in the blood are diplococci or diplobacilli. Wilson in his researches puts forward the view that the *Diplococcus exanthematicus* and the diplobacilli are secondary organisms. The author, with Ingram, suggests the theory that these bacteria represent harmless phases of the organisms which are filter passers but which have not yet been described. They were able to cultivate from fresh typhus blood, urine and cerebro-spinal fluid a minute filter-passing organism which could infect monkeys and be again recovered from them. It follows, therefore, to prevent typhus, thorough disinfection of the urine and excreta are as important as destruction of the ectoparasites. The disease has to be diagnosed from enteric, measles, uraemia and small-pox. The following pathognomonic points are given from which a positive diagnosis may be made:—

(1) The characteristic rash.
(2) The smell of the skin.
(3) History of previous cases in the house, especially if associated with lice.
(4) The precritical fall of temperature.
(5) The enormous relative and absolute increase in the large mononuclear cells in the blood.
(6) The presence in blood and urine of diplobacillary and diplococcal organisms.
(7) The presence in the centrifuged deposit of fresh urine of minute Gram-positive, Gram-negative pleomorphic organisms described by Hort and Ingram.
(8) The isolation and cultivation of the same organism from the blood and cerebro-spinal fluid, with the results of the injection of these cultures or fresh typhus blood into *bonnet* monkeys. P. W. B. S.

ROBERTSON (W.). Benzol in Bilharzia Disease. *Brit. Med. Journ.*, December 19, 1914.

In a case of bilharzia disease no improvement had been obtained after six months' treatment with sulphur, urotropin, male fern or methyl blue. When benzol was given the ova passed in the urine were observed to be black in colour and much shrunken. Ova tested on a slide with benzol also developed a black colour. In this case two weeks of the

treatment cleared up the [illegible] renal and bladder symptoms though a slight degree [illegible] remained Other cases similarly treated showed the [illegible] Robertson now recommends thymol 2 gr benzol 4 [illegible] every few hours for three or four weeks and then urinary antiseptics [illegible] with a return to the thymol benzol if necessary (This treatment might be of great use in cases of *Schistosomum japonicum* for which up to the present no drug has had any effect All ships liable to remain in the endemic area (Yangtse River) should be provided with the drugs but their poisonous character in combination with alcohol and oil must be remembered)

P W B S

ANDREWES (F W) On Arterial Degeneration, *Report of the Medical Officer to the Local Government Board* (1913 1914), 1915, Appendix B No 1, pp 151 208

This paper—the second of the author's contributions to the subject—describes two distinct investigations (1) on the influence of infective conditions in determining degeneration of the arterial wall, and (2) on the calcium content of the aorta in health and disease The first part deals with (*a*) the cultural and (*b*) the histological examinations of the aorta Cultural investigation of the media of the aorta to ascertain if it is actually invaded by bacteria in general infections has apparently not been previously employed It was carried out by a technique which prevented chance contamination in the *post mortem* room, and thirty six cases of acute infection were examined In acute streptococcic and staphylococcic septicaemia the liability to infection of the arterial wall is great whereas in malignant endocarditis, acute pneumonia and acute peritonitis the contrary holds good In infections of the urinary tract with *Bacillus coli* and its allies the results are usually positive Bacterial invasion of the media may either be by the primary infecting agent or the result of secondary infection In seven out of seventeen positive cases the micro organism was *Streptococcus salivarius* a common secondary infection Histological examination of the aorta in thirty seven cases of various infections excluding syphilis showed that the changes were slight as compared with those of syphilis In thirty five cases of general acute infections of ten different kinds the aorta was normal in 34 per cent, presented slight or doubtful inflammation in 29 per cent and definite inflammation in the media and adventitia in 37 per cent The infection occurs by way of the vasa vasorum It appears, therefore, that any acute infection may leave behind it as a chance sequel, minute foci of damage in the media, which though trivial in themselves may later in life, when the vessel is exposed to undue stress or tends to wear out, determine the distribution of visible sclerosis

The object of the second investigation was to ascertain if the percentage of mineral salts especially of lime, in the arterial wall provides a measure of the degree of degeneration present For this purpose ninety-one aortas were dried and analysed, and in the first place the normal calcium content of the aorta for the various decades of life were determined In youth the amount of calcium in the aorta is small and all in an ionic or 'vital' state Suddenly at about the age of 40 the calcium content begins to rise, and there is a deposit of insoluble lime salts—mainly phosphates, in the media and elsewhere which is never present in

a normal aorta under that age Examination [illegible] obviously diseased showed that in most arterial degeneration [illegible] content is increased In uncomplicated syphilitic [illegible] much advanced the percentage of calcium is notably below [illegible] But old syphilitic aortitis, for example in aneurysm [illegible] complicated by ordinary arterio sclerosis and an extreme [illegible] In ordinary arterio sclerosis the calcium content [illegible] raised in the initial stages In a few cases extensive [illegible] ulceration may occur without calcification possibly [illegible] of calcium metabolism With this exception [illegible] syphilitic aortitis the calcium content of the dried [illegible] a rough numerical expression of the degree of degeneration [illegible] blood pressure does not necessarily lead to degenerative change [illegible] at least for a considerable time possibly the condition of the aorta wall in high blood pressure is at first one of hypertrophy [illegible] some evidence from chemical analysis that excessive alcohol [illegible] causes premature arterial degeneration H D R

KLOTZ, OSKAR Nodular Endarteritis of the Aorta about the Intercostal Arteries *Journ Med Research*, Boston, 1915 vol xxxi, pp 409 430

The presence of button like areas of chronic endarteritis about the mouths of the intercostals is common and difficult to explain Their site —upon the posterior wall and therefore best supported part of the aorta— invalidates the mechanical theory namely that the endarteritis is a response to a weakening of the media From a study of twenty cases of fatal acute infections, Klotz concludes that this endarteritis is the result of the infective process The reaction of the intima of the aorta is most marked around the orifices of the smaller vessels especially the inter costals, but usually does not spread along the lumen of the branching vessels Fibrous and fatty degeneration follow the inflammatory change, and the later stages cannot be distinguished from atheroma with super ficial endarteritic thickening As bearing on the question why the nodular endarteritis occurs especially around the orifices of the inter costal arteries Klotz gives a detailed description of the normal anatomy of the origin of these arteries from the aorta The intercostal artery has no elements of its own during its passage through the inner two-thirds of the aortic wall in the outer third of the aortic wall the perforating artery gradually forms The mouths of the intercostal arteries have a valve like lip which projects downwards from the upper border The exits of the intercostal and intervertebral arteries differ architecturally from those of the larger arteries and thus give rise to a different blood current than at the mouths of the larger arteries through which a more or less steady stream is constantly rushing This difference in the blood stream may have a bearing upon the localization of bacteria or the influence of their toxins upon the underlying tissues H D R

AUER, JOHN The Functional Effect of Experimental Intraspinal Injec tions of Sera with and without Preservatives *Journ Exper Med*, N Y, 1915, vol xxi, pp 43 83

The occurrence of death during intraspinal injections of anti menin gitis serum has attracted attention and the following explanations have

been discussed Anaphylaxis liberation of toxins by rapid lysis of meningococci increased pressure in the cerebro spinal system, and intoxication from the phenol compounds often used to preserve the serum In a critical paper on these possible factors Flexner referred the lethal issue to increased cerebral pressure and pointed out that accidents have followed injection of anti meningitis serum which did not contain any preservative In order to determine the importance of the last two factors (increased pressure and toxic action of preservatives), Auer also of the Rockefeller Institute has investigated the effects on monkeys and dogs of intraspinal injections of normal serum serum preserved by 0 3 per cent tricresol by 0 3 per cent chloroform and by 0 3 per cent ether This paper contains eleven plates of blood pressure and respiratory curves, especially from monkeys which in general react to intraspinal injections very similarly to human beings He finds that one of the main dangers from intraspinal injection of 0 3 per cent tricresol serum is increased intraspinal pressure, but that tricresol exerts some influence This is shown by the more marked depression of blood pressure and respiration after tricresol serum as compared with the effect of chloroform serum, ether-serum, and plain horse serum The practical deduction is that the ideal preservative for therapeutic sera would be one which can be removed before injection Ether in this respect is better than chloroform The opsonins in anti meningitis serum are about equally affected by 0 3 per cent tricresol, 0 3 per cent chloroform or 0 3 per cent ether when tested after one week one month, and three months (M Wollstein) It would be advisable, when intraspinal injections are given to human beings, to be prepared to withdraw part of the injected fluid and to perform artificial respiration The withdrawal of fluid can be most safely carried out by the gravity method Incidentally Auer controverts the general impression that the gravity method of intraspinal injection abolishes the danger of increased intraspinal pressure H D R

YATES BUNTING and KRISTIANSON The Etiology of Splenic Anaemia, *Journ. Amer Med. Assoc*, 1914 vol lxiii p 2225

In a series of papers Yates and Bunting have described as the cause of lymphadenoma a pleomorphic diphtheroid micro organism which they call the *Bacillus hodgkini* From the spleens removed during life from two cases of splenic anaemia pure cultures of a diphtheroid micro organism apparently identical with or closely related to the *B hodgkini*, have recently been obtained Histological examination of the two spleens confirmed the clinical diagnosis of splenic anaemia Inoculations of a series of dogs and rabbits with cultures from one of these cases, and of another series with a culture from a gland of an undoubted case of lymphadenoma were made In each case the lesions characteristic of splenic anaemia resulted The authors therefore conclude that splenic anaemia and lymphadenoma are closely allied if not only variations in the manifestation of a single type of infection H D R

WELLER (C V) Age Incidence in Sarcoma, *Arch. Int Med*, Chicago, 1915, vol xv pp 518-523

It is generally stated in text books that sarcoma is a disease of the young and carcinoma of the aged, and it is usually believed that the age

incidence [illegible] malignant [illegible] Weller has [illegible] Pathological Laboratory [illegible] Michigan [illegible] years 1895 and 1913 The [illegible] ally affecting [illegible] males, 136 in females Until [illegible] does not [illegible] in females than in males [illegible] the author's previous study of the [illegible] in which it was shown that the [illegible] of the incidence [illegible] in females is largely determined [illegible] nomas of the [illegible] and uterus organs which early undergo [illegible] tion changes In Michigan the incidence of sarcoma up to the age of 35 years is less than it would be were sarcoma uniformly distributed throughout the entire population and after the age of 35 sarcoma is [illegible] more prevalent than such a uniform distribution would suggest The incidence of sarcoma is highest between the ages of 48 and 53 years and therefore cannot be regarded as a disease of the young After this age period the incidence of sarcoma gradually decreases Although in youth the sarcoma incidence is somewhat higher than the carcinoma incidence there is throughout life a well marked parallelism between the age incidence curves for the two forms of malignant neoplasm and for more than 40 years they are practically coincident H D R

WARTHIN (A S) The Occurrence of Malignant Neoplasms in the Young, *Arch Int Med* Chicago 1915 vol xv pp 411-430

Analysis of the same material (2,000 cases of malignant neoplasm) as that utilized above showed that in the age period of 1 to 30 years which was chosen as covering the entire period of development there were 195 or 9 75 per cent cases of malignant new growth There were 108 males and 87 females The forms of new growth were carcinoma 77 or 39 5 per cent sarcoma 93 or 47 8 per cent malignant teratoma 19 or 9 7 per cent malignant syncytioma 2 or 1 per cent and endothelioma 4 or 2 1 per cent If the cases of malignant teratoma and of malignant syncytioma are added to those of carcinoma, the types of malignant neoplasm are nearly evenly divided between the connective tissue and the epithelial growths In the first year of life there were eleven cases after this the curve falls to rise at puberty after which there is a steady rise up to the limit of the age period 30 The large number in the first year emphasizes the importance of the congenital factor The earliest examples of carcinoma were a squamous celled carcinoma of the lobe of the ear in a patient aged 4 years (no evidence of teratoid origin could be found) a squamous celled carcinoma of the skin of the leg at the age of 11 years and in the 14th year an adeno carcinoma of the umbilicus (teratoid in origin) a squamous celled carcinoma of the mouth a basal celled carcinoma of the eye, and an adeno carcinoma of the stomach Sarcoma predominated in infancy and childhood, but the parallel increase of both sarcoma and carcinoma with age contradicts the usual belief that sarcoma is essentially a disease of childhood Malignant teratoma occurred in early childhood and in developing sexual life The author concludes that the tendency to malignant tumours is relatively slight before sexual maturity is reached, increases during the period of sexual maturity up to the age period of 58 62, and decreases with the decline of the organism H D R

News of the Service

CASUALTIES

Killed

Fleet Surgeon [illegible] Arthur Forrester, M.B., of H.M.S. [illegible], April 25.

Fleet Surgeon [illegible] Waters, M.D., of H.M.S. [illegible], on May [illegible].

Surgeon [illegible] Whitey Quirk, of H.M.S. [illegible], on May 2[illegible].

Died of Wounds

Temporary Surgeon Thomas [illegible] Stuart, M.B., of the [illegible] R.N. Division, on June 10.

Temporary Surgeon Frederick H. Ross, M.B., [illegible] Battalion, R.N. Division, on June 21.

Wounded

Temporary Surgeon [illegible] Schlesinger, [illegible] May 2[illegible] at the Dardanelles.

Temporary Surgeon W. [illegible] MacClean, [illegible] May [illegible] at the Dardanelles.

Surgeon J. R. Kay Mouat, R.N.V.R., [illegible] at the Dardanelles.

Temporary Surgeon D. D. Pinnock, [illegible].

Temporary Surgeon W. [illegible] June 6 at the [illegible].

Surgeon W. Bradbury, M.B., on June 10 at the Dardanelles.

Prisoners of War

Staff Surgeon Louis [illegible] [illegible].

Surgeon E. C. Hortom [illegible].

Surgeon Probationer W. W. [illegible] Brown, R.N.V.R., [illegible] May [illegible] sinking of [illegible].

PROMOTIONS

Staff Surgeon S. H. Woods, M.B., [illegible], promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon [illegible] T. Sutcliffe, M.B., B.A., promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon [illegible] H. Greenhalgh, M.D., promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon Edward T. Burton, promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon Robert Hughes, promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon [illegible] J. Bosh[illegible], promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon Herbert L. [illegible], M.B., B.A., promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon John H. Lightle, promoted to rank of Fleet Surgeon, May 15, 1915.

Staff Surgeon [illegible] Williams, promoted to rank of Fleet Surgeon, May 15, 1915.

Surgeon Campbell [illegible], M.B., promoted to rank of Staff Surgeon, May 14, 1915.

Surgeon Cecil R. M. Baker, M.B., promoted to rank of Staff Surgeon, May 14, 1915.

Surgeon [illegible] Vickery, M.B., B.A., promoted to rank of Staff Surgeon, May 14, 1915.

Surgeon Henry D. Drummond, M.B., promoted to rank of Staff Surgeon, May 14, 1915.

Surgeon C. D. Marshall, F.R.C.S., R.N.V.R., promoted to rank of Staff Surgeon, R.N.V.R., March 31, 1915.

Surgeon Ebenezer Snel[illegible], R.N.V.R., promoted to rank of [illegible] Staff Surgeon, R.N.V.R., June 8, 1915.

APPOINTMENTS

March

to the A[illegible] to the Albatross [illegible] the Waverley D W[illegible] the D[illegible] the Minstrel E J [illegible]

APRIL

Fleet Surgeon [illegible] to the Victory addl for disposal [illegible]

[illegible] Surgeon [illegible] to the [illegible] addl for [illegible] Hospital [illegible] Royal [illegible] to the Blake [illegible] addl for hospital [illegible] to the hospital [illegible] to West College [illegible] Turner [illegible]

[illegible] Pembroke addl for disposal J S [illegible] Palace [illegible] Hospital [illegible] Hospital [illegible] Hospital [illegible] M B to [illegible] Hospital [illegible] Hospital [illegible] addl for disposal [illegible] Somali [illegible] M B to the hospital [illegible] Power M B [illegible] Depot Crystal Palace [illegible] J A Russell [illegible] Haslar Hospital [illegible] Downs [illegible] to Haslar Hospital [illegible] Haslar Hospital [illegible] addl for disposal W H Kay M B to the [illegible] addl for disposal J R L [illegible] addl for disposal [illegible] for disposal [illegible] addl for disposal [illegible] to R N Division [illegible]

Surgeon [illegible] to the Vivid [illegible] Denham to the [illegible] to the Attack [illegible] Ward to the Badger F O M[illegible] to the Garland [illegible] to the Hermes [illegible] E R Cripps to the Mansfield [illegible] to the [illegible] W [illegible] to the Fisgard [illegible] D B [illegible] Jones to the Victory [illegible] J C Coll[illegible] [illegible] L Ward to the Alcantara

MAY

Fleet Surgeon [illegible] R [illegible] Ja[illegible] to the Dreadnought J Martin to Malta Hospital M J S[illegible] to the [illegible] R N (Retired) to Devonport Dockyard R T [illegible] to the [illegible] addl for disposal [illegible] P [illegible] to the Prince of Wales H B [illegible] addl for disposal W H Pope to the Vivid addl for disposal [illegible] B [illegible] (Retired) to perform the duties of Medical Transport Officer [illegible] addl [illegible] to his present inspecting duties

Staff Surgeon [illegible] C Hunt to the [illegible] W P Hingston to the Argonaut [illegible] M D to the Vivid addl [illegible] C H Dawe to the Stonewall Jackson [illegible] Admiral [illegible] C R Rickard to the Topaze [illegible] M S Richardson [illegible] F C Robinson to the General Grant

[illegible] Drennan to the Victory addl. [illegible] Griffiths to the Vivid addl. for disposal. W. K. D. Bicton to the [illegible] to the Pembroke addl. for disposal. J. C. Bungen to the Victory [illegible] disposal. J. J. H. Rooney to the [illegible] addl. for disposal. A. [illegible] addl. for disposal. [illegible] W. Newport to the Vivid addl. [illegible] Drennan to the Carysfort. J. J. H. Rooney to the Robert [illegible] Prince Rupert.

Surgeons [illegible] M.B. [illegible] disposal. [illegible] Cook to the Vivid, addl. for disposal [illegible] addl. for disposal. A. M. Henry to the Victory addl. [illegible] the Pembroke addl. for disposal. F. H. Stephens [illegible] to Naval Air Station Roehampton. J. [illegible] R.N. [illegible] for disposal. G. B. Cockrem to the Vivid addl. for disposal [illegible] Pembroke addl. for disposal. F. C. Wright to the Vivid addl. [illegible] to the Jonquil. C. G. Sprague to the [illegible]

Staff Surgeons R.N.V.R.: [illegible] F.R.C.S. [illegible] Haslar Hospital. W. [illegible] M.D., to the Satellite.

Surgeon R.N.V.R.: [illegible] addl. for disposal. C. H. F. Atkinson to the Tipperary.

Temporary Surgeons: [illegible] Thomas M.B. to the [illegible] addl. for disposal. W. L. [illegible] F.R.C.S. to the hospital ship [illegible] M.B. to Royal Marine Depot [illegible] to Chatham Hospital [illegible] hospital [illegible] M.B. to the Pembroke addl. [illegible] M.B. to the Pembroke addl. for disposal. W. C. [illegible] to Haslar Hospital. [illegible] to the Victory addl. for disposal. C. H. [illegible] R.N. Air Station. W. B. Cunningham to the [illegible] M.B. [illegible] M.B. to the [illegible] Hospital. G. W. Woodhouse to Chatham Hospital [illegible] Haslar Hospital. J. [illegible] M.B. to Haslar Hospital. J. A. Watson [illegible] R.N. Air Station. [illegible] Craig to Haslar Hospital. W. [illegible] Pembroke addl. for disposal. R. Tunstall M.B. to Chatham Hospital [illegible] Chatham Hospital. [illegible] Snell M.B. to Chatham Hospital [illegible] the Antrim [illegible] M.B. [illegible] Cleopatra [illegible] W. Whitfield to the [illegible] the Agincourt [illegible] to the Apex [illegible] Haslar Hospital. J. Paxton to Haslar Hospital. J. R. [illegible] to the [illegible] C. W. [illegible] M.B. [illegible] the hospital ship [illegible] Rowan to the hospital ship [illegible]

Surgeon Probationers R.N.V.R.: [illegible] J. T. Johnston to the [illegible] C. J. Penny to the Liberty. [illegible] J. P. Fleming to the [illegible] J. J. [illegible] I. M. Robertson to the [illegible] to the Meteor. N. H. Jupe to the [illegible] J. P. Johnston [illegible]

OBITUARY.

Killed in Action.

Fleet Surgeon Adrian Andrew [illegible] M.B. was killed [illegible] during the fighting in the Dardanelles on April 26, 1915 [illegible] of H.M.S. "Implacable," of which he was Senior Medical Officer.

He was educated at Glasgow University, graduated M.B. [illegible] 189[illegible] and entered the Royal Navy on November [illegible] the following year. [illegible] the training brig [illegible] in the Channel Squadron. [illegible] Station, and after serving for two years at [illegible] Hospital [illegible] the "Pyramus." This was followed by two years at the Recruiting Depot in Whitehall, during which he was Honorary Secretary to the United Services Medical Society. He joined the "Implacable" in February 1914 [illegible]

[illegible]

FLEET S[illegible] M.S. [illegible] on May [illegible] 1915, [illegible]

[illegible] M.D. [illegible] in 1884 [illegible] promoted to [illegible] Southampton [illegible] the Naval [illegible] promoted Fleet [illegible] When [illegible] went [illegible] done and skill [illegible]

Died of Wounds

[illegible] M.B., D.P.H., was severely wounded [illegible] and died of his wounds two days [illegible]

He [illegible] graduated M.B., B.Ch. in 1911. [illegible] Surgeon and [illegible] Birkenhead [illegible] Liverpool and Parkhill [illegible] Surgeon [illegible] Royal Naval Hospital and [illegible] an expert swimmer [illegible]

Killed in the "Princess Irene" Disaster

SURGEON FREDERICK W[illegible] was serving [illegible] Medical Officer of the ship when she was suddenly destroyed [illegible] lying at anchor [illegible] on May 27.

Educated at Merchant Taylors' School and St. Mary's Hospital, he qualified M.R.C.S., L.R.C.P. [illegible] and entered the Navy. After serving [illegible] a few months he [illegible] in 1912 he [illegible] England just before the war. When [illegible] commenced [illegible] he was appointed to the [illegible] March 1915. He was [illegible] representing his Hospital in Rugby football [illegible] cup at the Hospital athletic sports [illegible] the United Service Rugby XV [illegible] in open competitions at county tournaments.

Deaths from Other Causes

FLEET SURGEON JOHN MORAN, M.D., [illegible] on May 18 while on sick leave staying with his relatives [illegible]

Educated at Queen's College, Cork, he graduated [illegible] 1881, M.D. in 1884 and Master of Surgery in 1885. He entered the Navy [illegible] year and served in the [illegible] from 1887 to 1889 on the West Coast of Africa. He was present at the blockade of the Opobo River and subsequent [illegible] He afterwards [illegible] at Bathurst, on the [illegible] the punishment of [illegible] the Medal and Clasp 1891. He also served on the Australian and Mediterranean Stations and in the Home Fleet. He was a well read man of sound judgment and a most painstaking practitioner. Every detail of his work received [illegible] and no duty was deemed [illegible] conscientious [illegible] one of the most popular officers in our Service.

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Journal of the Royal Naval Medical Service.

Original Articles.

REPORT ON CEREBRO-SPINAL FEVER IN THE ROYAL NAVY (AUGUST, 1914—AUGUST, 1915)

By Temporary Surgeon General H. D. ROLLESTON, M.D., F.R.C.P., R.N.
Consultant Physician to the Royal Navy, Royal Naval Hospital, Haslar; Senior Physician, St. George's Hospital.

THE cases of cerebro-spinal fever in the Royal Navy from August, 1914, to July 31, 1915, have been investigated by order of Sir Arthur May, K.C.B., Director General, with the main object of determining what measures should be adopted to prevent or minimize an epidemic outbreak of this disease in the coming winter of 1915-1916. The enclosed report contains—

(I) A discussion of the etiology of the cases.

(II) A history of the outbreaks at various centres.

(III) A summary of the rarer manifestations and complications.

(IV) A summary of the results of treatment.

(V) Recommendations as to prevention (i) of the disease and (ii) of its spread.

(I) ETIOLOGY OF THE CASES

The cases of cerebro-spinal fever in the Royal Navy amount to 170, of which 90, or 52.9 per cent., proved fatal.

Incidence.—The cases naturally occurred mainly where large numbers of ratings were collected.

There were 33 cases at the Crystal Palace; 21 cases at the Royal Naval Barracks, Chatham; 25 cases were traced to Deal; 16 occurred in the Royal Naval Barracks, Portsmouth, which at the time was not

over crowded there were 1[illegible] cases at the Royal Naval Barracks Devonport 12 cases at the Royal Marine Artillery Barracks, Eastney, and 10 cases in the "Impregnable"

In some instances, however large numbers of men were collected together without a corresponding incidence of the disease

At Blandford although drafts from infected centres (the Crystal Palace and Deal) were received, six cases only occurred, three of which were in the Deal Battalion, which was isolated from the rest of the camp until February 20, between February 1 and 4 or shortly after their arrival from Deal and must therefore be regarded as having originated at Deal At the Royal Marine Light Infantry Barracks, Forton, no cases really originated although four cases were borne on the books On the "Powerful I" there were two cases only both on April 10, when there were 600 boys

The disease may occur in sudden outbursts, so as to suggest a virulent focus or the presence of carriers inside a barracks, or may crop up in an intermittent or isolated fashion, so as to point to infection contracted outside

Thus at Deal 13 cases occurred between January 19 and February 4, and no cases after March 14 In the "Impregnable" 5 cases occurred between February 8 and 12, and none between February 24 and May 30 At Eastney 4 cases 3 of which could be traced to a probable source of infection in the barracks occurred between January 18 and 20

On the other hand, at the Royal Naval Barracks, Portsmouth, 16 cases occurred in six months (January 27 to July 31), the most in any one month (March) being 4 In addition 2 men went sick with the disease shortly after leaving the barracks

In the Royal Naval Barracks, Chatham the cases occurred in such continuity from January 27 to March 17 as to suggest an internal origin, after that date there were 3 cases only, and of these 2 could be traced to outside infection At the Royal Naval Barracks, Devonport, there were 7 cases between February 13 and March 4, and then no more until infection was introduced from outside on March 21 Twelve cases occurred in sea going ships and in one instance only did two cases occur in the same vessel (the "Biarritz")

The monthly incidence with the results is shown below The largest number of cases and of deaths occurred in February —

Month	Cases	Deaths		Invalided	Recovered
November	1	0		1	0
December	2	1		0	1
January	27	16 or 59 per cent		1	10
February	60	35 „ 58		1	24
March	35	15 „ 42 8		3	17
April	24	8 „ 33 4		0	16
May	12	6 „ 66 7		1	3
June	6	4		—	2
July	1	3		—	—
	170	90			

The Question of the Communicability of the Disease—It has been authoritatively stated that a very definite feature of epidemics of cerebro spinal fever is the isolation or want of ascertained contact between the cases of the disease, and it has even been suggested that it is not more communicable than pneumonia, and in this connexion the extreme rarity of infection of medical officers and nurses in hospital might be mentioned This is an important point, for if the etiology of the disease is on the same plane as that of pneumonia it would not be worth while to attempt isolation of meningococcic carriers.

Out of the 170 cases some evidence of infection was traced in 59, or rather more than a third, this is by no means convincing proof of the communicability of the disease but it should be stated that the opportunities for tracing the infection, which appears to be largely conveyed by carriers, varied in different places, especially as to contact with carriers At Chatham infection was traced in 12 out of 24 cases, whereas among 33 cases at the Crystal Palace the infection was traced in 8 only, and among 20 cases at Deal a connexion was forthcoming in three instances only It is obvious that the more the cases can be investigated the larger the number in which the source of infection is traced

The following points noticed among the cases in the Navy are in favour of the view that the disease is spread from one individual, either suffering from the disease or a carrier, to another

(1) Spread of the disease from an infected focus —A draft of men of the Naval Brigade from Deal carried the disease to the camp near Blandford, where at least one man, who was in billets and went sick appeared to have communicated the disease to a civilian living in the house In Portsmouth where there was one civilian case in 1914 as contrasted with sixty two in 1915 up to June 22, the first civilian case was in a child aged 4½ years on February 11, who attended the Royal Naval Artillery School, Eastney in which recruits were also taught By this time six recruits from Eastney had gone down with cerebro-spinal fever, the last on February 9 During the following eight days four other children of about the same age in the neighbourhood of Eastney became infected

(2) The way in which outbreaks appear to be stopped by isolation of contacts and mild disinfection of the throat

In the "Impregnable" 5 cases occurred between February 8 and 12 on the two following days 123 contacts were removed to the Royal Naval Hospital, Plymouth, and of these 31 were found to be carriers, 2 of which

developed the disease on February 15 and 19 respectively. On February 19 a boy on leave developed the disease, but otherwise no case could be traced to the 'Impregnable' until a boy, who left that ship on April 3, developed the disease on the following day in the Royal Naval Barracks, Portsmouth. On April 10, 3 cases of cerebro spinal fever occurred in the 'Powerful I' in a mess where a carrier was afterwards found, who, fifty six days previously had had influenza in a severe form (possibly cerebro spinal fever) at Liverpool. Fifty five contacts were segregated (15 carriers), and no further cases occurred. At the Royal Naval Barracks, Chatham, 5 cases occurred among the engine room artificers, between February 1 and March 17; 130 men were examined, 30 of these had nasal or faucial catarrh, and of these 3 were found to be carriers and were isolated. After this no more cases occurred among the engine room artificers. At Deal all the men using the swimming bath sprayed their throats with a mild antiseptic before bathing and no case occurred after March 14.

(3) The difference between the incidence of the disease in barracks and institutions in the same port.

In the Portsmouth district at the Royal Marine Light Infantry Barracks, Forton, no case originated (although 4 cases were borne on the books), whereas at the Royal Marine Artillery Barracks there were 10 cases at least, and at the Royal Naval Barracks, Portsmouth 16 cases. On the hypothesis that cerebro spinal fever is not more infectious than pneumonia its incidence, other things being equal, should be in proportion to the number of men in the respective barracks, namely, the Royal Marine Light Infantry Barracks, 1, the Royal Marine Artillery Barracks $1\frac{1}{4}$, the Royal Naval Barracks, Portsmouth, $5\frac{1}{2}$. This proportion was not shown, for at the Royal Marine Artillery Barracks, Eastney, where there was, as already mentioned, an outburst of cases suggesting an internal focus of infection, there was relatively a great excess over the other two. At the Royal Naval College, Osborne, no case has occurred.

(4) The detection of carriers who have been in contact with cases of the disease and have formed a bridge between them. This was shown to occur in several instances at the Royal Naval Barracks, Chatham, by Deputy Surgeon-General C. J. Mansfield, M.V.O.

The experience of the cases of cerebro spinal fever in the Navy is therefore in favour of the usually accepted opinion that the disease is communicable, and that precautions to prevent infection are necessary.

The spread of the disease depends in the first instance on infection from (*a*) carriers, (*b*) abortive and undetected cases, (*c*) patients recognized to be suffering from the disease. The first two are the most important, whereas the last is so obvious as not to require discussion. An attack of the disease, however, may be

followed by a chronic carrier state, which may possibly be periodic or intermittent, with positive and negative bacteriological results alternating

A case of cerebro spinal fever at the Crystal Palace had been in contact with a man who after recovering from the disease had returned to duty on bacteriological examination he was found not to be a carrier (*vide* p 394) in this instance the spread of infection was not proved, but possibly he was a periodic carrier In September, after the period covered by this Report, an outbreak of three cases of cerebro spinal fever among boys in the Royal Naval Barracks, Portsmouth was traced to a boy who had recovered from the disease and returned to duty bacteriologically he was proved to be a carrier (Fairer)

(*a*) *Carriers*—This is a most important and difficult question in connexion with the spread of the disease. If carriers could be entirely eliminated the disease would be abolished, and the prophylaxis of cerebro spinal fever is largely concerned with the detection, isolation and sterilization of carriers (*vide* p 404 *et seq*) It is probable that under conditions which depress their resistance carriers would be become attacked by the disease, and this reasonable assumption would explain the occasional occurrence of very long incubation periods.[1] It is therefore remarkable how rarely known carriers contract the disease, among 170 cases of cerebro spinal fever there were 3 or 1 7 per cent, in recognized carriers under treatment, these 3 cases occurred among the 227 carriers detected around 120 cases or a percentage of 1 3 The importance of carriers is therefore mainly that they may convey the disease to others

The difficulties lie in (1) the detection of healthy carriers, this could only be attempted by the examination of every man in the Service and as the carrier state is usually of short duration (about three weeks), and as some carriers are intermittent, showing the presence and absence of meningococci alternately the work thus involved would be prohibitive

(2) The discrepancy as to the numbers of carriers among contacts Thus some authorities, for example Flügge, have found that as many as 70 per cent of close contacts are carriers, while others have estimated the percentage as low as 7 (von Lingelsheim) In the Navy the results have varied considerably, this probably depends on the employment of different standards in the bacteriological diagnosis at various centres

[1] The French memorandum states that the incubation period may be as long as thirty six days (*vide Brit M d Journ.* 1915 i, p 321)

At Plymouth, out of 402 close contacts 97, or 24 per cent, were positive, and out of 1,056 remote contacts 74, or 7 per cent, were positive (Whiteside) At Deal among 97 close contacts 16 were positive, while of 35 remote contacts none were positive (E A Shaw) Out of 122 close contacts from the Crystal Palace 12 or 9 per cent, were positive (Bassett Smith) At Chatham, out of 243 who were sleeping next to or in the same mess as a case of cerebro spinal fever 20, or 8.5 per cent were positive (Dudley) At Portland, out of 58 close contacts 5 or 8.6 per cent, were positive (Shand and Hitch) Out of 222 close contacts examined at the Royal Naval Hospital Haslar, there were 2, or 0.9 per cent, positive (Dudding)

(3) The present state of our knowledge as regards the morphology of the infective agent of cerebro spinal fever It has recently been suggested that the meningococcus is only a phase in the cycle of a pleomorphic micro-organism which causes the disease[1] If so, this would bear on the failure to recognize carriers and so to limit the spread of the disease

(4) The possibility that the disease may be conveyed by carriers other than human beings such as lice, fleas and other parasites, the virus passing direct into the circulation, is at present hypothetical, but it is worth consideration from the point of view of prophylaxis

(5) *Abortive Cases*—The existence of such cases is likely to be detected only when an epidemic is in progress, at other times they may be regarded as "influenza" or "catarrh" Such cases may occur among those in contact with the sick, and their occurrence among relatives nurses, and medical attendants should be borne in mind The first or catarrhal stage of cerebro-spinal fever may be prolonged, and during this period be indistinguishable from influenza some of the cases in the Navy have been of this nature and have been instrumental in spreading the disease

At the Crystal Palace three cases occurred among the Public Schools Battalion between February 10 and 14 one of them had been ill with catarrh since January 28, and among his contacts three positive cases were found

The disease may abort in the catarrhal stage, and these cases are more active in the spread of the malady than the cases which run the characteristic course and are therefore isolated

A man in the Naval Brigade at the Crystal Palace went sick with what was thought to be influenza on March 16 He went home, and subsequently his wife and child died of cerebro spinal fever On

[1] Hort, Lakin and Benians *Brit Med Journ* 1915 vol i pp 541 715

March 31 he was admitted to the Croydon Hospital where he was regarded as a case of cerebro spinal fever although lumbar puncture was not performed

The coincidence of a high sick rate of catarrhal affections (influenza, catarrh, tonsillitis sore throat) with the occurrence of cases of cerebro spinal fever has been noted in several though not in all instances, and it may be pointed out that not only may catarrhal affections dispose to meningococcic infection but that some patients regarded as "catarrh or 'influenza may be abortive cases of cerebro-spinal fever

Conditions which may favour the Spread of the Disease —(1) Overcrowding is a recognized factor in favouring the outbreak of the disease It appears to act by increasing the number of carriers, and probably by spreading other diseases, such as influenza and catarrh which weaken the patient s resistance and thus favour the carrier state or virulent meningococcic infection

In connexion with the influence of overcrowding on the incidence of cerebro spinal fever attention may be drawn to the Royal Naval Barracks, Devonport where twelve out of the fifteen cases of the disease occurred in the blocks with the lowest cubic space (*vide* p 390)

The danger of overcrowding must not be estimated solely in terms of cubic space, for in summer when men are more in the open and are less tempted to circumvent proper ventilation, over crowding is less productive of cerebro-spinal fever than in winter Overcrowding to an extreme degree may occur without cerebro-spinal fever, provided infection is obviated. Thus in both the "Powerful' and the "Impregnable' there is great overcrowding, but in both, on the appearance of the disease, isolation of contacts and removal of carriers were followed by stoppage of the outbreak Conversely an outbreak may occur in the absence of overcrowding, thus at Eastney five cases occurred between January 15 and 20, when the number of men was considerably under the full complement

(2) Catarrhal affections—catarrh, influenza, tonsillitis, and sore throat—were numerous during the early months of 1915 and their prevalence roughly coincided with the outbreak of cerebro-spinal fever The greater prevalence of catarrhal affections in the first quarter of 1915 as compared with the first and last quarters of 1914, as shown at Deal and Shotley, suggests some connexion with the cerebro spinal epidemic

In some barracks and establishments the maximal incidence of

cerebro-spinal fever occurred in the month during which catarrhal affections were most numerous

At the Royal Marine Artillery Barracks, Eastney, both catarrhal affections and cerebro spinal fever were at their maximum in January, at the Royal Naval Barracks, Chatham at the Crystal Palace, and in the "Impregnable" this occurred in February

At these centres there was some evidence that carriers existed among the occupants, and it is therefore justifiable to suggest that the prevalence of catarrhal affections favoured the carrier state and facilitated infection In support of this contention it may be mentioned that at the Royal Marine Light Infantry Barracks, Forton, catarrhal affections were few and no cases of cerebro-spinal fever originated in the barracks In the "Powerful," where two cases only occurred on April 10—a month which had a small incidence (68) of catarrhal affections as compared with the preceding month (March having 136 the highest for the first half of the year)—15, or 27 per cent, carriers were found among 55 contacts, at first sight it might appear that these circumstances militate against the view that a high incidence of catarrhal diseases favours the carrier state. But reflection shows that as the two cases and the detection of carriers occurred early in April the influence of the high incidence of catarrhal diseases in March was still active

In the Royal Naval Barracks at Portsmouth and Devonport, there was no exact relation between the incidence of catarrhal diseases and of cerebro-spinal fever In both of these instances there was a dearth of evidence of a focus of infection inside the barracks, and it is perhaps reasonable to suppose that the cases were mainly introduced from without

In conclusion, there appears to be a relation between the incidence of catarrhal affections on the one hand and of cerebro-spinal fever cases on the other.

(3) Age incidence In civilian practice cerebro-spinal fever is pre-eminently a disease of childhood and adolescence Among the 170 cases in the Navy, 103, or 60·6 per cent, occurred under 20 years of age, and the number of cases progressively diminished in each successive decade while the mortality percentage rose This is shown in the following table —

Age periods	Number of cases and percentage of the total 170 cases	Deaths and percentage in the age periods
16—19	103 or 60·6 per cent	45 or 43·7 per cent.
20—29	43 25·3	27 , 62·8 ,
30—39	13 7·6	10 76·9 ,,
40—49	8 4·8 ,,	6 ,, 75·0
50—59	3 , 1·7 ,,	2 ,, 66·7 ,,

It must, however, be remembered that there was a very large number of young recruits in the Navy and that there are probably special factors at work which dispose them to cerebro spinal fever

(4) Recent enlistment Newly joined recruits were specially attacked by the disease

At the Royal Naval Barracks, Devonport, there were 15 cases of cerebro spinal fever of these 1 had been in the Service over a year, and the remaining 14 were recent recruits with an average of thirty days service Of 21 cases at the Royal Naval Barracks Chatham, 11 were recent recruits with an average service of twenty four days (7 with less than twenty days service and 1 with eighty eight days service)

Youth is generally recognized as a factor favourable to the incidence of cerebro spinal fever but in addition the following factors lower the vital resistance of recent recruits (a) Depression and home sickness comparable with that of a boy during his first term at school (b) vaccination on entry and antityphoid inoculation in the Naval Brigade (c) fatigue and over exertion due to drills and marches The effect of fatigue was shown in the Deal Battalion which left Deal on January 24 to march to Maidstone stopping the first night at Littlebourne the second at Charing and the third at Bearsted the next day (January 27) three men went sick with cerebro spinal fever at Maidstone The battalion then went by train to the camp near Blandford, where three more men went down with the disease on February 1, 3, and 4

In the following case investigated by Fleet Surgeon B Hill C V O the three factors—overcrowding the depressing effect of antityphoid inoculation and fatigue—were all present A private, aged 19 who occupied a room with 250 cubic ft of space in Upper Walmer was inoculated against typhoid fever on February 22, 1915 next day although feeling out of sorts he did a hard day's work and at 7 p m went by train to Sandwich where there had recently been an outbreak of cerebro spinal fever On February 24 he felt ill and stayed in bed and on the following day was delirious and found to have cerebro spinal fever

(5) Meteorological conditions might naturally be expected to exert some influence on the incidence of cerebro-spinal fever Thus east and north winds and a low atmospheric temperature or a sudden fall of temperature might by reducing the resistance to bacterial invasion lead directly to meningococcic infection or by favouring other infections of the naso pharynx dispose to the carrier state During the epidemic it appeared to many medical officers that cases came under observation in connexion with a cold snap, and were less frequent when the weather was warm and calm It therefore seemed worth while to investigate the relation, if any,

between the direction of the wind and the daily temperature, on the one hand, and the occurrence of cases of cerebro spinal fever on the other It may be said at once that the results do not justify any definite conclusion

In the first instance the monthly incidence of cerebro-spinal fever was compared with the prevailing winds and it appeared that there was some evidence to support the preconceived view that northerly and easterly winds favour the occurrence of the disease At Portsmouth, Plymouth and Deal cases of the disease followed in the wake of north and east winds, but at Chatham no decided conclusion as to the influence of winds was forthcoming The direction of the wind on (*a*) the day of onset of the disease and (*b*) on the three previous days was then plotted out for 93 cases occurring at Portsmouth, Plymouth, Chatham and Deal On the actual day of onset the wind was more or less east or north in 50 cases and south west, or calm in 43 On the three days before the onset of the disease the wind was more or less east or north in 47 south or west in 35 and in 11 cases varied during the three days On the whole, there is not sufficient evidence that east and north winds play an important part in causing an outbreak of the disease

The question of the atmospheric temperature was gone into In some, but not in all instances, the months with the lowest average daily temperature showed the largest number of cases of the disease, but the difference in the average daily temperatures was so comparatively small that no conclusion as to its influence is justified

In the Portsmouth district the larger number of cases occurred in January (T = 46° F) and March (T = 46° F), and fewer in February (T = 49° F) and April (T = 54.4° F) At Chatham more cases were seen in February (T = 38° F) than in January (T = 40° F), March (T = 43° F) or April (T = 49° F) At Deal 7 cases occurred in January (T = 44.4 F) 10 in February (T = 45° F) and 3 in March (T = 48° F) At Plymouth, however, no such relation existed

As a sudden fall of temperature might reduce the vital resistance to infection this question was investigated The temperatures (day and night) for three days before the onset of the disease in 93 cases from Portsmouth, Plymouth Chatham and Deal were examined in order to see if there was a sudden fall of temperature of 10° F or more within this period Out of the 93 cases there was such a fall in 37 only and not in the remaining 56 There is, therefore no reason to believe that a sudden fall of the atmospheric temperature causes an immediate outbreak of the disease

Finally an enquiry was made as to the relation between the

prevailing wind and the average daily temperature combined and the incidence of cerebro spinal fever Consideration of the monthly incidence of 82 cases of cerebro-spinal fever with the prevailing winds and the average daily temperature for January to March at Portsmouth, Plymouth Chatham and Deal shows that practically half the cases occurred in February, during which the prevailing wind was south west and the average daily temperature 43·[illegible]° F, whereas in January the wind was west or south-west in the first half and north or north east in the second half, and the average daily temperature 43·7° F, in March the prevailing wind was north east and the average daily temperature 45° F There is not therefore, any real evidence that north and east winds and a low atmospheric temperature play a causal part in the outbreaks of cerebro spinal fever

January 20 Cases

Portsmouth	10 cases	the coldest month there	(4[illegible]° F)	prevailing wind	1st half W & S W
Deal	7		(44·4 F)		
Chatham	1	not the coldest month there	(40·8° F)		2nd half N & N E
Plymouth	0	"	(45° F)	–	

February 40 Cases

Chatham	9 cases	the coldest month there	([illegible] F)	prevailing wind S W	
Plymouth	17	cold month there	(41·8 F)		
Portsmouth	4	not the coldest month there	([illegible]9 F)		
Deal	10	–	(45 F)	–	–

March 22 Cases

Plymouth	1 cases	cold month there	(43·8 F)	prevailing wind	N E
Chatham	5	not the coldest month there	(4[illegible] F)		S W
Portsmouth	11		(4[illegible] F)		N E
Deal	3	–	(45 F)		

(II) HISTORY OF THE OUTBREAKS OF CEREBRO SPINAL FEVER AT VARIOUS CENTRES

The Portsmouth District [1]

The 36 cases treated in the Royal Naval Hospital Haslar were drawn from the Royal Naval Barracks Portsmouth (16 cases) the Royal Marine Artillery Barracks Eastney (12 cases) the Royal Marine Artillery Barracks Forton (4 case) and 4 isolated cases from the "Excellent," the "Vernon" and the "Firegard" respectively [2]

[1] A report on 31 cases treated at the Royal Naval Hospital Haslar was made by Staff Surgeon B S Robson R N and Temporary Surgeon L Pearce Gould R N in the Journal of the Royal Naval Medical Service 1915, vol i No 3 pp 330 [illegible]

[2] One case admitted on March 1 to Haslar from the Royal Naval Barracks, Portsmouth with German measles developed cerebro spinal fever on March 10 as the medical officer who attended the patient also looked after the cerebro-spinal cases and

In Portsmouth the total number of cases among civilians (including the dockyard employees) up to June 23 was 62. At the Alexandra Hospital, Cosham, which serves a large military area, there were 19 cases of cerebro-spinal fever from January 1 to August 14. The first naval case in the Portsmouth district was a private at the Royal Marine Artillery Barracks, Eastney, on January 15; the first military case was reported on January 19 in the Royal Field Artillery, Hilsea; and the first civilian case on February 11 in a boy aged 4½ years close to Eastney Barracks and probably infected from that source (*vide* p. 375). Out of the 36 cases treated at the Royal Naval Hospital, Haslar, the source of infection was traced in 17. Of the 36 cases, 19 proved fatal, a mortality of 52.7 per cent.

In the Portsmouth district the monthly incidence of cases in the Navy was as follows: January 10, February 4, March 11, April 3, May 4, June 3, July 1. This incidence was compared with the following meteorological conditions forwarded by Fleet Surgeon G. T. Bronte: the direction of the wind, the saturation of the atmosphere with water, and the day and night temperatures from January 1 to April 30. Up to January 15, when the first case occurred, the wind was west and south-west; for the rest of the month it was north and north-east. In February the prevailing winds were west and south. In March the winds were west up till March 6; after this they were mainly east or north. In April the wind was mainly south-west. It therefore appears that north and east winds favour the incidence of cerebro-spinal fever, whereas south and westerly winds do not. The average daily temperature in January was 46° F., in February 49° F., in March 47° 1, and in April 54.4° F. A lower daily temperature, with east or north wind, appears to coincide with an increased incidence of cerebro-spinal fever. The saturation of the atmosphere with moisture and the difference between the day and night temperatures did not appear to exert any influence on the incidence of the disease.

The Royal Naval Barracks, Portsmouth.—The first case of cerebro-spinal fever occurred on January 27, and at this time there was little, if any, overcrowding. The only mess in which a certain amount of over-crowding has been unavoidable, namely, that of the chief petty officers, has never had any case of cerebro-spinal fever. In March, 1915, arrangements were made to allow 500 cubic feet space to each man.

Sixteen cases occurred in the barracks in six months (January 27 to July 31), the most in any one month (March) being 4. This sporadic incidence and the evidence as to the source of infection, as far as it goes, justify the conclusion that the disease was in most instances contracted outside. In addition to these 16 cases, two men developed cerebro-spinal fever shortly after being drafted from the barracks. Most of the cases were in young recruits; 13 of the patients were under 20 years of

had a bad cold at the time, it is just possible that he acted as a carrier, and that the infection was contracted in Haslar and not at the Royal Naval Barracks, where the last case occurred on February 24 in a signalman who left the Crystal Palace on February 20. On the other hand, the occurrence of German measles may have either converted the patient, supposing he was a carrier, into a case of cerebro-spinal fever, or have prolonged the incubation period of cerebro-spinal fever. As there is thus doubt about the origin of infection, this case is not included among those originating in the barracks.

age (with seven deaths) [illegible] were between 20 and 30 years of age and were all [illegible] the cases was 18·5 years and of the 10 fatal cas[illegible]

The probable source of [illegible] 8 cases. The first case, on January 27, contracte[illegible] Chichester. In the second case, on January 30, the source of [illegible] not traced. There were 3 cases in February; the th[illegible] was not traced, the fourth (February 9) was in the sa[illegible] first case (January 27) and the fifth (February 21) had [illegible] before from the Crystal Palace, where there had been [illegible] in the first sixteen days of February. There were 3 in Ma[illegible] was not traced, 2 probably contracted the disease in Gosport [illegible] there was a small outbreak at the time and the other [illegible] the disease from the fifth case. Up to the end of March there [illegible] of which 7 proved fatal and 1 was invalided whereas after th[illegible] there were 7, with 3 deaths and 1 invaliding. In April there [illegible]—a boy, who arrived the day before from the "Impregnable III," where, however, there had not been any case since February and non[illegible] till May 30; moreover, he came from a mess in which no [illegible] of the disease had appeared. In May, 2 cases occurred in boys [illegible] from the "Impregnable III" from a mess in which a case occurre[illegible] 11, seven and fourteen days previously. One of them [illegible] left permanently blind. In June there were 3 cases, on the 10th, [illegible] and 28th, which could not be traced, and there was another on July 30.

A tabular statement of the monthly [illegible] of influenza, catarrh, tonsillitis and sore throat did not re[illegible] relationship between their prevalence and that of cerebro spinal fe[illegible]. This negative evidence may be correlated with the view that there [illegible] not many active carriers in the barracks for prevalence of catarrhal [illegible] would tend to favour the carrier state and the outbreak of cerebro spinal fever.

Month	Cases of cerebro spinal fever	[illegible]
January	2	[illegible]
February	3	231
March	1	[illegible]
April	1	[illegible]
May	2	[illegible]
June	3	[illegible]

Out of 132 contacts exam[illegible] bacteriologically only o[illegible] was positive (De Ma[illegible])

Royal Marine Artillery Barracks, Eastney.—As the first case in the Portsmouth district occurred in these barracks on January 15 and as it was suggested that the infection was introduced into the barracks by a Canadian team which came to play football against the barracks on January 9, this question was discussed in a previous report which may now be summarized. It is known that four cases of cerebro spinal fever occurred in the camp at Valcartier, in Canada, that there were three cases during the voyage to this country, and many in their camp on Salisbury Plain, but none of this Canadian team is known to have been a carrier or to have had the disease and none of the opposing Eastney team contracted cerebro spinal fever. Swabs from the throats of the Eastney team sent

to Greenwich was proved to be negative by Fleet Surgeon P W Bassett Smith, C B The Canadian team slept in a separate room with some sergeants, none of whom had cerebro spinal fever and for the most part kept to themselves They were, however, shown round Portsmouth by a member of the Eastney team who was a friend of the private who first contracted the disease and was also in daily contact with two men who went down with it on January 20 It was impossible to trace this line of infection any further If any connexion is to be maintained between the Canadian and the Eastney epidemics it must be assumed that there were at least two undetected carriers one among the Canadian team, who transferred the infection to a member of the Eastney team—probably the one who showed them round and was a friend of the private who first manifested the disease On the other hand the almost simultaneous outbreak of cases in other parts of the country and the weakness of the assumption of two hypothetical carriers make it probable that the epidemic was due to some undetected chronic carrier, and that the Canadians cannot be held responsible for the infection

There was no evidence of overcrowding in the barracks, which together with the School of Music has an individual cubic space of 560 ft at this time all the rooms, except one from which cases of cerebro spinal fever came were below their normal complement

Influenza and catarrh were severe in January, the total of such entries for the weeks ending January 16 23 30, during which there were 6 cases of cerebro spinal fever numbered 52 and 56 as compared with 36 and 41 for the whole of February during which there was 1 case only of cerebro spinal fever, and 22 and 41 in March, during which there were 3 cases of cerebro spinal fever These catarrhal conditions, by facilitating infection of the throat by meningococci, and so the existence of carriers might favour an outbreak of the disease

Investigation of the places visited by the men during Christmas leave did not show any evidence that the disease was contracted elsewhere

Of the 12 cases there were 6 in January (5 occurring between January 16 and 29) 1 in February, 3 in March, and 2 in May Of the 6 cases in January 5 died, whereas of the 6 subsequent cases 1 only proved fatal

The infection was traced in 5 out of the 12 cases The second and fourth were infected from the first case the fifth was infected from the third case the tenth was in the sick bay with the ninth case and showed symptoms of cerebro spinal fever three days later the eleventh case probably contracted the disease in Birmingham

Of the 12 cases 7 were under 20 years of age with 3 deaths, 2 between 20 and 29 with 2 deaths 2 between 30 and 39 with no deaths and 1 aged 42 fatal The average age of all the cases was 23 2 years of the fatal cases 21 years and of the recoveries 22·2 years

Forty close contacts were examined and all found to be negative

Royal Marine Light Infantry Barracks, Forton—Four cases of cerebro spinal fever were reported from this depot but in none of them did the infection originate in the barracks In January two occurred in privates who had quite recently (three and five days) been drafted from Deal, and almost certainly brought the disease with them A quartermaster who worked in the barracks contracted the disease on March 9, he lived in Gosport, and cases of the disease occurred at that time in the immediate

neighbourhood of his house and on March 11 his son was attacked with a rash and a temperature of 105° F. The fourth case was that of a man who, though nominally in the barracks, had been lent to the anti-aircraft guard in Weevil's Yard and had not been in the barracks for some months. He slept in a crowded and ill ventilated room in Weevil's Yard, and four days before the onset of cerebro spinal fever returned from leave at Farnham, Surrey, where there were instances of cerebro spinal fever among the troops.

It is suggestive that there was very little influenza, catarrh, sore throat or tonsillitis in the barracks. From January 1 to May 1 there were 37 cases of influenza, 63 of catarrh, 36 of tonsillitis and 4 of sore throat. There was no overcrowding in the early part of this year.

Out of 20 contacts 1 was found to be positive (Dudding).

Isolated cases were sent into the Royal Naval Hospital, Haslar, from the "Vernon," the "Excellent" and the "Fisgard." In none of these was the source of infection traced. The contacts were all negative.

ROYAL NAVAL BARRACKS, CHATHAM

In the spring of 1911, two cases occurred (on March 3 and April 22) among the stokers in the "Pembroke." In August 1914, the cubic space fell to 210 ft. per man. The first case of cerebro spinal fever to occur during the War was a stoker in the "Pembroke" on October 29, and the third on January 15 was in the same ship; the occurrence of cases in the "Pembroke" raises the possibility of a chronic carrier in that vessel, though the intervals are long. The second case arose on January 10 and the source of infection was not traced. The fourth case occurred on January 27 and was followed by 14 cases (9 in February) at short intervals up to March 17, so as to suggest infection from within the establishment, and more than half of these cases were traced to carriers or to infection from previous cases. After this date 3 isolated cases occurred; 1 in the "Pembroke" was not traced, the other 2 probably contracted the disease outside, making 21 in all, with an average age of 26 years. Eleven of the 21 cases were in recruits, many of whom had recently joined; their average age was 21 years and their duration of service twenty four days (7 having less than twenty days' service and 1 as long as eighty eight days). Five had been recently vaccinated, 2 had shortly before the onset received a blow on the head, and 2 others had recently had scarlet fever—factors which, by reducing resistance, would favour infection. Between February 1 and March 17 there were 5 cases among the engine room artificers. One hundred and thirty of these men were then examined; 30 were found to have nasal or faucial catarrh, and from among these 3 carriers were isolated. The mess was then divided into two so as to give more air space, and after this there were no more cases among the engine room artificers.

Ninety two contacts were sent to the Royal Naval Hospital, Chatham, and 12 carriers were isolated. One of the carriers developed the disease while isolated and died. Of the 21 cases, 9 were definitely traced to healthy carriers by Deputy Surgeon General C. J. Mansfield, M.V.O. All these 21 cases were transferred to the Royal Naval Hospital, Chatham, and 16 died, or 76 per cent. As the mortality rises with each decade up to 50 it might be assumed that this high mortality was due

to the fact that 10 of the patients were over 30 years of age. But this was not so in this instance, for of the 11 patients under 30 years of age 8 died, as against 8 deaths among the 10 patients over that age. In addition, 3 cases from other sources (Shotley 1, the "Biarritz" 1, H.M. Dockyard 1) were treated at the Royal Naval Hospital, Chatham.

CASES OF INFLUENZA, CATARRH, SORE THROAT AND TONSILLITIS FROM JANUARY 1 TO JUNE 30, 1915, AT THE ROYAL NAVAL BARRACKS, CHATHAM.

Disease	January	February	March	April	May	June
Influenza	169	101	74	96	48	13
Catarrh	154	204	111	103	72	37
Sore throat	30	30	29	19	16	11
Tonsillitis	40	78	136	88	65	61
	393	413	350	306	201	125

The maximum incidence of cases of cerebro-spinal fever (9) and of catarrhal affections of the throat (413) occurred in February, and the large number of catarrhal affections (393) in January might be thought to have favoured the carrier state and so to have been instrumental in leading to the comparatively large number of cases of cerebro-spinal fever in the following month. The incidence of cerebro-spinal fever (5) and of catarrhal affections (350) in March corresponded with the observation that three cases of the former appeared to be due to infection in the barracks (two by the same carrier). In April, although the number of catarrhal cases was not much less (306), the activity of meningococcic infection in the barracks had ceased, the only case of cerebro-spinal fever having contracted the disease in West Ham.

The direction of the wind and the day and night temperatures from January 1 to April 30 were examined in relation to the incidence of cerebro-spinal fever. In January the wind was mainly west or south-west for the first half of the month, and north and north-east in the second half of the month; two cases occurred in the first half and one in the second half. The average daily temperature was 40.5° F. February, during which there were 9 cases, was cold (average temperature 38° F.), although the wind was almost always south-west. In March there were 5 cases, all before March 17, and up to this date the wind was more often west or south-west than north or east. In the second half of the month there was rather more north and east wind than in the first half. The average temperature for the first seventeen days and for the last fourteen days was in each case 42° F. In April there was one case of cerebro-spinal fever (on April 5). The direction of the wind was on the same lines as in January, but the average daily temperature was 49° F.

So far, therefore, the occurrence of cerebro-spinal fever would appear to be associated much more with west and south-west winds than with east and north-east winds; but examination of the direction of the wind on the three days preceding the occurrence of cases during January to April shows that in about half the cases south and west winds, and in the rest east and north winds, prevailed. No decided conclusion, therefore, is justified as to the influence of the direction of the wind on the incidence of the disease. The largest number of cases occurred in February, which had the lowest average daily temperature, namely 38° F.

PLYMOUTH DISTRICT.

In the summer of 1914 there were 7 cases in the 'Impregnable' and 2 in the 'Powerful.' Sporadic cases began to arise among the civilian population in January, the first naval case having occurred on December 22, when on leave.

Thirty cases are considered here; 27 were treated in the Royal Naval Hospital, Plymouth, and the remaining 3 went sick when on leave. A man from the 'Ajax' was also treated in the Royal Naval Hospital, but is not included here. Of the 30 cases 15 were in the Royal Naval Barracks, 9 in the 'Impregnable,' 3 in the Royal Marine Light Infantry Barracks, 2 in the 'Powerful,' and 1 in the 'Indus.' One boy borne in the 'Indus' was in the Royal Naval Barracks, and is therefore included under that heading. A boy who left the 'Impregnable' on April 3, where there had not been cases since February 12, developed cerebro-spinal fever the next day at Portsmouth (*vide* Portsmouth District, p. 385).

Two cases occurred in December, 1914 (on December 22 and 25), none in January, 17 in February, of which 5 were in the 'Impregnable,' 3 in March, 6 in April, and 2 in the last two days of May. There was an interval of five weeks between the cases in April and those in May; there was a corresponding freedom from the disease among the military and civil population until the end of May, when there was a recrudescence.

Up to March 1 there were 19 cases with a mortality of 9, or 47.3 per cent, whereas among the 11 subsequent cases there were 2 deaths only. The total mortality of 11 out of 30 cases, or 36.7 per cent, is very low. This is probably related to the fact that 25 of the patients were under 20 years of age and that none was over 30, for though the disease specially attacks the young, the mortality increases with age (*vide* p. 380). The average age of the 30 cases was 18 years (of 19 recoveries 17.7, and of fatalities 18.3 years). Out of the 30 cases the source of infection was traced in 11.

Overcrowding occurred at the Royal Naval Barracks, in the 'Impregnable,' and in the 'Powerful.'

In December, 1914, in which cases occurred on the 22nd and 25th, the wind was south-west for the first nine days, then easterly until the 14th, and northerly on the 22nd, 23rd, 24th. Although not convincing, the occurrence of east and northerly winds before the onset of the disease is suggestive. In January, in which there were no cases, the wind was westerly or north-east from the 21st to the 29th, and thus preceded the outbreak of 17 cases of cerebro-spinal fever in February, during which the wind was mainly south-west. In March there were 3 cases only, and there was a good deal of east and north wind, especially from the 22nd to the 29th. On April 5 a man who had been in close contact with a case, and had had catarrh for some days, showed meningeal symptoms; possibly the cold winds at the end of March may have been instrumental in his illness. For the first seven days of April the wind was south-west, and for the remainder of the month mainly northerly; cases of the disease occurred on the 14th, 21st, and 26th. There was therefore some evidence that the disease is prone to follow in the wake of east and north winds.

The comparison of the average daily temperature with the monthly

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incidence of cerebro-spinal fever did not show any striking correspondence between a low temperature and the incidence of the disease

	Month	Average daily temperature	Cases of cerebro-spinal fever
1914	December	44·4° F	2
1915	January	45·0°	0
	February	43·8°	17
	March	43·8°	3
	April	48·5°	6

Fleet Surgeon H C Whiteside found that out of 402 close contacts 97, or 37 per cent, were carriers Two of these carriers developed the disease Remote contacts were also examined out of 389 from the Royal Naval Barracks (where there were 15 cases) 45 or 11·6 per cent were carriers out of 667 from the Youths Training Establishments 29 or 4·35 per cent, were carriers Of the 1 458 contacts close and remote, 171 or 12 per cent carriers were found[1] Close contacts were persons who had slept in close proximity to a patient or were in the same mess or otherwise brought into close relationship with him Remote contacts were all those who slept in the same room or were in the same training class as a patient

The Royal Naval Barracks, Devonport contain five blocks (A B C, D, E) A block contains three rooms with a normal cubic capacity per man for messing accommodation of 293 cubic feet and for sleeping accommodation 354 cubic feet B block contains four rooms with corresponding cubic spaces of 302 and 355 cubic feet C D, and E blocks each contain four rooms with corresponding cubic spaces of 216 and 274 cubic feet It is noteworthy that of the 15 cases there were 12 in blocks D and E and only one in B block This is compatible with the view that deficient cubic space favours the spread of the disease Further in February when there was overcrowding in the barracks the largest number of cases (6) in any one month occurred Out of the 15 cases 1 had been in the Service over a year, the other 14 were recent recruits with an average service of thirty days

The figures given below show that the incidence of catarrhal affections (influenza catarrh, sore throat and tonsilitis) in the barracks was highest in January and February, and that though the maximal incidences of the catarrhal affections and of cerebro-spinal fever both occurred in February the correspondence in other months was far from exact It might be thought that the high incidence of catarrhal affections in January during which month there were no cases of cerebro-spinal fever, was instrumental by favouring the carrier state in the occurrence of 6 cases beginning on February 12

Month	Cases of catarrhal affections	Cases of cerebro-spinal fever
1914—December	135	2
1915—January	355	0
February	364	1
March	210	2
April	134	4
May	100	1
June	97	0

[1] Fleet-Surgeon H C Whiteside dealt with the bacteriological examination and treatment of contacts at the Royal Naval Hospital, Plymouth in the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE, 1915 vol i No 3 pp 248-264.

Two cases occurred in December in men who were in the same room and came from Ashburton. The first, who had not been home for some time, was taken ill in the barracks on December 22 and infected the second, who went sick when on Christmas leave on December 25. In January there were no cases. The next case was on February 12 and was followed by cases on the 14th, 18th, 23rd (two cases) and 26th, and on March 4. Then, after an interval of seventeen days a man who had come to Plymouth the day before was taken ill on March 21, and obviously brought the infection with him; he travelled down with a man who after attending the sick quarters for some days manifested meningeal symptoms on April 5. In the meanwhile an untraced case occurred on March 31. Cases cropped up on April 11, 21 and 26. Then there was an interval of thirty-three days until the last case occurred on May 29. It is noteworthy that both in the civil and military population of the district there was a corresponding freedom from the disease with a recrudescence at the end of May.

Fleet Surgeon H. C. Whiteside examined 78 close contacts and found 15 or 19.2 per cent. positive, and 389 remote contacts with 45 or 11.6 per cent. positive—a high percentage.

The "Impregnable" establishment consists of three ships and has no official complement; the number of boys varies greatly with recruiting. The following estimate of the cubic space is provided by Fleet Surgeon F. Fedarb. "Impregnable I" has a cubic space in the sleeping compartments varying from 175 to 291 and averaging 244 cubic feet per boy. "Impregnable II" has a cubic space in the sleeping compartments varying from 167 to 308, and averaging 203 cubic feet per boy. "Impregnable III" has a cubic space in the sleeping compartments varying from 210 to 497 and averaging 313 cubic feet per boy. There is therefore very definite overcrowding in all three ships. I inspected the ships by day on July 9, and the boys' class room in "Impregnable II," which has, I understand, been already condemned, was obviously stuffy. I also went over the "Impregnable" that night at 10 p.m. with the expectation of finding the air in the sleeping compartments offensive. It was a quiet fine night and the ports were open; the only place in which the air seemed offensive was the boys' class room, which is used as a sleeping compartment for twenty-eight boys with a cubic space of 183 ft. per boy, but on that night held twenty boys with a cubic space of 256 ft. per boy.

In the summer of 1914 there were 5 cases of cerebro-spinal fever in the "Impregnable." Between February 8 and 12, 1915, 5 cases of the disease occurred, 4 being from "Impregnable III," though from different messes, and one from "Impregnable II." On February 13 and 14, contacts to the number of 123 were removed to the Royal Naval Hospital, Devonport, and 31 carriers were detected. The carriers were detained and 2 of them developed cerebro-spinal fever on February 15 and 24. On February 19 a boy from "Impregnable III" went on leave to Torquay and developed the disease. The outbreak then stopped and it may be concluded that the isolation of the contacts played a part in this, especially as two of them subsequently went down with the disease while in hospital. On April 3 a boy was drafted from "Impregnable III," where he was in a mess which had not contributed any case of cerebro-spinal fever, to the Boys' Training Establishment, Royal Naval

Barracks, Portsmouth [illegible] the next day On April 24 two boys [illegible] of cerebro spinal fever occurred on February 11 were transferred from "Impregnable III" to the Royal Naval Barracks, Portsmouth They developed the disease on May 1 and 8 respectively The last case occurred on May 30 in "Impregnable I" where no cases of cerebro spinal fever had previously arisen He joined the "Powerful" on March 23 was transferred on April 3 (the same day as the boy referred to above) to the Royal Naval Barracks Portsmouth, where he was in the same room and in an adjacent mess to the two boys drafted there on April 24 from "Impregnable III" He was discharged to the "Impregnable" on May 21

February during which the outbreak of 8 cases of cerebro spinal fever occurred had the highest incidence of catarrhal affections (catarrh sore throat, tonsillitis and influenza)

	Month	Cases of [illegible]	Cases of cerebro spinal fever
1914	December	2[illegible]	0
1915	January	7[illegible]	0
	February	68	8
	March	12	0
	April	[illegible]	1*
	May	4[illegible]	3†
	June	60	0

* This boy was drafted from the "Impregnable" on April 3 and developed cerebro spinal fever next day at Portsmouth

† Two of the boys drafted seven and fourteen days previously from the "Impregnable" developed the disease at Portsmouth The other boy was drafted to the "Impregnable" from Portsmouth eight days before he went sick

The "Powerful" establishment consists of two ships—"Powerful" I and II The boys are distributed in these two ships according to their work "Powerful II" is stated not to be overcrowded but "Powerful I" is certainly overcrowded on April 10 when the two cases of cerebro spinal fever occurred, there was a cubic space of only 225 ft in the sleeping compartments The hammocks are within 10 in of each other, and the casements, in which classes of about twenty boys are held have a cubic space of from 1,690 to 1,705 ft or 85 cubic feet per boy Catarrhal affections are common, as is seen by the following table for the first six months of 1915, furnished by Fleet Surgeon Oswald Rees —

Month	Catarrh	Sore throat	Tonsillitis	Total cases	Total of days sickness
January	31	42	18	91	377
February	17	61	[illegible]	123	697
March	41	[illegible]	38	126	677
April	1[illegible]	30	13	62	370
May	16	11	10	67	120
June	25	18	35	19	180
	160	209	176	554	2 821

Practically all the cases of sore throat and tonsillitis have been isolated in casements and this would tend to prevent their spread This isolation has not been adopted with the cases of catarrh

In 1914 two cases of cerebro spinal fever occurred in the "Powerful" In 1915 two cases occurred on April 10 in the same mess in "Power

fal I Fifty fiv[illegible] or 27 per cent, detected [illegible] had had influenza in [illegible] previously, and was probably the [illegible] occurred With condition[illegible] of the disease is striking and remarkable

Royal Marin[illegible] — [illegible] cases occurred in these [illegible] not friends, and the[illegible] Two of them belonged to the same [illegible] not in rooms that opened on to the [illegible] Fleet Surgeon J Andrews, R N could not discover an[illegible] between the men or that they had visited infected houses [illegible] inclined to the view that the infection might have been acquired [illegible] picture halls which they visited There were, however, comparatively [illegible] cases of cerebro spinal fever in the civilian population Dr O Hall the Medical Officer of Health for Plymouth informs me that during the first six months of this year, seventeen civilian cases of cerebro spinal fever were notified Adequate precautions were taken at the barracks and no more cases occurred

Indus —Two cases occurred in boy artificers borne in the 'Indus but one of them had been billeted in the Royal Naval Barracks until two or three days before the onset of the disease on February 23 and should therefore be considered as belonging to the Royal Naval Barracks The other case had been billeted in the Royal Naval Barracks until three weeks before the onset on March 4 Of 18 contacts from the 'Indus, 3, or 16 6 per cent were found to be carriers

Crystal Palace

At the Crystal Palace there were between January 16 and the end of July 33 cases of cerebro spinal fever, with a mortality of 21 or 63 6 per cent Up to March 1 there were 17 cases, of which 14, or 82 per cent were fatal after March 1 there were 16 cases of which 6, or 37 5 per cent were fatal A falling mortality in the course of epidemics is generally recognized but it should be pointed out that the cleanliness and ventilation of the men s quarters were much improved in the later part of the outbreak The cases were mainly among young recruits the average age of all the cases was 23 years ; 16 were under 20 years of age and 27 under the age of 25 Of 16 under 20 years of age, 8 proved fatal of the 27 under 25 there were 16 deaths while of 6 cases over the age of 25 years, 5 died While, therefore, the majority of the cases were young patients the mortality ratio increased steadily with the age

The first case occurred on January 16 in a boy who returned from Christmas leave (December 30 to January 6) he had been to Aberdeen, where there had been a case of cerebro spinal fever in a Canadian, fatal on December 5, but none since he may also have visited Glasgow, where cases had occurred The second case on January 20 was not traced, then after an interval 3 occurred on January 29 and 1 on February 1, 2, and 3 Fifteen contacts from these cases gave uniformly negative results After an interval of four days the ninth case occurred in the Officers Training Corps on February 7 Two days later a man who

slept in the same [illegible] Case 7 developed the disease and 1 of the 4 contacts [illegible] carrier Between February 10 and 14 [illegible] occurred in the [illegible] Battalion and among the contacts of 1 case that had [illegible] January 28 3 carriers were found Some weeks lat[illegible] this battalion were found to be negative [illegible] among the Officers Training Corps on February 14 and March [illegible] contacts being negative Isolated [illegible] occurred on February 23 and March 1 Then on March 14 to [illegible] 3 arose in B Company 1st Battalion, the contacts of 1 case giving 3 carriers, one of whom was positive for three weeks Isolated cases [illegible] on March 15 and 16 and then there was a lull till March 23 when a sporadic case appeared On March 27 there were 2 cases in the same company Five occurred in the first thirteen days of April, and after there was none until July 8, when a man who had been in contact with Case 26 who had returned to duty went sick A fresh bacteriological examination of faucial swabs from Case 26 proved negative

Altogether the infection was traced in 8 cases out of the 33, or 24 per cent The close proximity of the Crystal Palace to London no doubt favoured the introduction of the disease from outside infection

The contacts 132 in number were examined by Fleet Surgeon P W Bassett Smith, C B, who found 12, or 9 9 per cent. positive.

Deal

The barracks consist of three groups of buildings some distance apart and with separate blocks in each An increase in the number of men was naturally accompanied by an increase in the sick list; thus in the January to March quarter of 1914 there were 115 cases of catarrh as compared with 292 in the corresponding quarter in 1915, but while the number of men was about doubled the cases of catarrh were nearly trebled Overcrowding therefore increased the incidence of catarrh, which would favour the spread of meningococcic infection For some years at least there had not been any case of cerebro spinal fever in the barracks

The origin of the outbreak was not discovered There were no civilian cases in Deal or Walmer, but there were some at Sandwich eight miles off A man who went sick on February 1 had spent his Christmas leave (December 23 to 28) at Salisbury (town), where, the Medical Officer of Health (Dr Fison) informs me the first case of cerebro spinal fever occurred on December 13, in a nurse (engaged to a Canadian officer) in the hospital, the second on December 20 and the third on December 28 Analysis of the recruits squads and companies of the cases showed a wide distribution of the disease, and did not explain how the infection spread, but as the canteen, the recreation and billiard rooms are common ground, contact may have occurred there

The outbreak in the barracks of what was subsequently (February 5) determined to be cerebro spinal fever really began on January 20 and fresh cases followed almost daily until February 13, when there was an interval of twelve days 2 cases then occurred on February 25 and 27 and then after another interval 3 cases on March 10 12, 14 After this there were no more cases The cessation of the epidemic may possibly have been connected with the fact that all the men using the warm swimming bath sprayed their throats before bathing

The Deal Marine Depot was apparently responsible for 25 cases, 17 were treated in the infirmary and 3 developed at Maidstone among the 1,000 men who marched there from Deal. The 20 cases are considered here. In addition 2 occurred at the Royal Marine Light Infantry Barracks, Gosport, on January 19 and 24 within a few days (five and three respectively) of leaving Deal (*vide* Report on Portsmouth district) and 3 occurred among the Deal Battalion shortly after their arrival at Blandford (*vide* Report on Blandford).

Of the 20 cases 6 proved fatal. Out of 17 before March 1, there were 6 deaths, whereas the 3 cases after that date recovered. This percentage of deaths (30) is the lowest in any of the groups of cases though that of 36.7 per cent in the Plymouth district approximates to it. All the patients were under 20 years of age the average age being 17.6 years (for 14 recoveries 17.8 years and for 6 fatalities 17.3 years). The remarkably low death-rate at Deal is probably due to the fact that all the cases were under 20, for, as shown elsewhere, the mortality is less under 20 years of age than at any other period of life, thus the mortality (45) of all the cases in the Navy (103) under 20 years of age was 43.7 per cent, as compared with 62.8, 76, 77, and 66 per cent for four succeeding decades.

The disease did not spread to non-commissioned officers or to the children of married men living in barracks but the schoolroom for these children was no longer used at other times by the men.

One hundred and thirty-two contacts were examined, of these, 97 were close contacts with 16 positive results and 35 remote contacts all negative. The percentage of positive results among the 132 contacts was 12.1 (E. A. Shaw).

During the first fifteen days of January the wind was with one exception west or south-west on January 16 and 17 north-west winds preceded the outbreak of the epidemic from January 19 to 21 the wind was west and for the rest of the month mainly east or north-west. During February in which 10 cases of cerebro-spinal fever occurred the wind was south or south-west on twenty days and north-west on the remaining eight days. But 8 of the cases occurred in the first thirteen days that is, after the north-west winds at the end of January; the other 2 cases occurred directly after the north-west winds on February 23 to 25. In March, north-east and north-west winds on the 7th, 8th and 9th preceded the appearance of the last 3 cases of the disease on March 10, 12, 14. The occurrence of north and east winds was thus followed by the incidence of cerebro-spinal fever cases.

The following shows a comparison between the average daily temperature and the monthly incidence of cases of cerebro-spinal fever:—

	Average daily temperature	Cases of cerebro-spinal fever
January	44.4°	7
February	45°	10
March	45°	3

Blandford

The camp was opened in January, 1915, and the first case of cerebro-spinal fever occurred on February 1 in the Deal Battalion. On February 3 two cases occurred, one in the Deal Battalion and the other in the

"Collingwood" Battalion which was in the Blandford Camp. On February 4 another man in the Deal Battalion went sick. After an interval of a fortnight a man in the "Howe" Battalion manifested the disease. The sixth and last case—a sporadic one—occurred on April 9 in the "Benbow" Battalion.

At the Marine Depot at Deal an outbreak of cerebro-spinal fever really began on January 20, though its nature was not absolutely settled until February 5. In the meanwhile 1,000 men marched on January 24 from Deal *en route* for the Blandford Camp; they stopped the first night at Eastbourne, the second at Charing, the third at Bearsted, and the following morning (January 27) entrained from Maidstone, where three men went down with the disease. On its arrival in Dorset the battalion was isolated for three weeks at Durweston and Stourpaine, some miles from the main camp at Blandford; the men were billeted in cottages, and two of them developed cerebro-spinal fever; in one instance the infection spread from one of these men to a girl in the same cottage. Four other civilian cases occurred.

Of the six cases four died. Four cases were under 20, one was 24, and one aged 34. The average age of all the cases was 22 years, of the fatal cases 22·7 years, and of the two recoveries 21 years. The cases were transferred for treatment to the Royal Naval Hospital, Portland, where 58 contacts were examined; 4 were positive on the first examination, and negative afterwards. One sick berth attendant was positive on two occasions (Shand and Hitch).

Meteorological records were not kept at Blandford. January and February were both very wet.

Shotley Barracks

There are fifty-two dormitories, each with a cubic space to each boy of 476·6 ft. Some of these dormitories are usually empty in preparation for drafts which are constantly arriving. During the War, each dormitory has had an individual cubic space of 400 ft. The beds are now arranged with the head and foot alternately. In one dormitory (No. 17) there have been as many as sixty-seven occupants, with a cubic space of 356 ft., but no case of cerebro-spinal fever occurred in it. The boys do not live or eat during the day in these dormitories. The "gymnasium dormitory," which contains 105 boys who live, eat, and sleep in it, is used for isolating drafts from barracks, usually for ten days. The class-rooms, which take classes of about twenty-five each, appeared to be well ventilated, with, in most instances, a cross draught. There does not, therefore, seem to be any reason to consider that overcrowding has been responsible for the cases.

The seven cases of cerebro-spinal fever occurred in newly joined boys on an average, twenty-five days after entering the service; the shortest period (two cases) was seventeen days and the longest forty-two days after joining. A case of cerebro-spinal fever in a man aged 28 was treated in the hospital, but is not included here; he came from the "Queen Victoria," and had not been ashore for one month.

The first case occurred on January 23 and was transferred to the Royal Naval Hospital, Chatham, proving fatal on March 20. After an interval of five weeks three cases appeared between February 28 and

March 4 two of these cases (onset February 28, March 4) joined the same day (February 13) from different parts of the country and slept for one night only in the same dormitory In the home of the other boy (onset March 1), who joined the barracks on February 8 some soldiers had been billeted The other three cases occurred on April 26 May 29, and June 10 Analysis of the dormitories and classes of the seven cases did not reveal any evidence of the spread of infection Three of the cases had been recently vaccinated, the interval between vaccination and the onset of cerebro spinal fever being twelve, seventeen, and seventeen days respectively

In the Felixstowe district there were thirty cases of cerebro spinal fever between January 21 and July 6 and eighteen before February 28, and no cases between April 23 and June 27 It is therefore improbable that the last two cases at Shotley (on May 29, June 10) were imported from the Felixstowe district There was one case of the disease in 1914, on October 28 in a child aged 1 year 10 months. The incidence at Shotley of catarrh and tonsillitis during the first half of 1915 was much higher than in the corresponding period of 1914 Thus from January to March 1915 there were 203 cases of catarrh and 33 of tonsillitis as compared with 35 of catarrh and 47 of tonsillitis in January to March, 1914 From April to June 1915 there were 99 cases of catarrh and 129 of tonsillitis as compared with 62 and 69 in the April to June quarter of 1914. In the last quarter of 1914 (no cases of cerebro spinal fever) there were 18 cases of catarrh and 86 of tonsillitis as compared with 203 and 33 in the first quarter of 1915 (4 cases of cerebro spinal fever) A high incidence of catarrh therefore coincides with the occurrence of cerebro spinal fever From the monthly return of catarrh and tonsillitis it is seen that the high incidence of catarrh (85) in February preceded the small outburst of three cases of cerebro spinal fever, February 28 to March 4

1915	Catarrh	Tonsillitis
January	58	10
February	85	7
March	60	16
April	62	37
May	25	52
June	12	80

Contacts were examined by Staff Surgeon Dudley at the Royal Naval Hospital Chatham and some were examined by Dr Sheffield Neave, who was doing bacteriological work at Ipswich the latter arrangement obviated the risk that the swabs might fail to reveal the meningococcus because of the delay in conveying them to Chatham One positive contact only was found

Cases in Sea going Ships

Twelve cases occurred in sea going ships and in one vessel (the "Biarritz") only was there more than one case a most satisfactory result The cases occurred in the "Changuinola" (January 20) "King George V" February 19) the "Implacable" (February 23) the "Ajax" (March 11), the "Queen Victoria" (April 1), the "Norma" (April 22), the "Bellerophon" (April 23) the "New Zealand" (April 25), the "St Vincent"

(May 9) the "Biarritz" (May 19), the "Liverpool" (May 25) and the "Biarritz" (July 19) The probable source of infection was traced in 3 cases The average age of the 12 cases was 26 years of the 8 fatal cases 28 5 years, and of the 4 recoveries 21 5 years

Naval Sick Quarters, Wicklow

One fatal case of cerebro-spinal fever occurred in a chief petty officer who contracted the disease from a carrier from Cork

"Akbar" Establishment

The "Akbar" establishment consists of three hulks moored side by side The men on board are civilians engaged in engineering work In two hulks the ventilation is deficient but especially in one, the lower deck of which only provides an individual cubic space of 220 ft for men messing and sleeping In the other hulk the arrangements appear to be adequate Four cases of cerebro spinal fever occurred in the "Akbar" establishment on March 26 April 11 April 22, and June 5 They were all treated at the Dingwall Hospital and recovered

For the most willing and courteous help in this investigation, I offer my sincere thanks to the medical officers of the hospitals, barracks and establishments which it has been my privilege to visit in addition to those incidentally mentioned above I must refer to the following Deputy Surgeons General H W G Doyne, V G Thorpe Fleet Surgeons M Rodd, J A Campbell C L W Bunton W J Colborne, J C Ferguson, C Strickland T W Parker R Hickson R Hill C V O, W H S Stalkartt Staff Surgeon B Pick Surgeons C H Gimlette J C Baggs, J A Farrer and to Dr J J Jervis (Croydon Borough Hospital) Dr F Ford Caiger (S W Fever Hospital) Dr Mearns Fraser (M O H Portsmouth) Dr Linton (M O H, Tunbridge Wells), Dr A K Chalmers (M O H, Glasgow), Professor M Hay (M O H, Aberdeen) Dr J Robertson (M O H Birmingham), Dr Dunlop (M O H Torquay), Dr G I P Stewart (M O H East Suffolk) Dr Conford (M O H, Felixstowe), Colonel Caldwell and Lieut M Culpin, R A M C (Alexandra Hospital, Cosham)

(III) SUMMARY OF THE RARER MANIFESTATIONS AND COMPLICATIONS

More or less complete notes of 163 out of the 170 cases were obtained and abstracted But as comparatively little interest would attach to an analysis of all the constant or common symptoms, such as fever, headache, rigidity of the neck, retraction of the head, Kernig's sign, delirium, and vomiting, the rarer symptoms and complications will be briefly mentioned here But before summarizing the rarer symptoms it may perhaps be permissible to refer to the rashes, which are rare in sporadic cases, at least as far as

[illegible] were striking [illegible] Rashes were noted in [illegible] 102 cases [illegible]. In a few of these 102 cases the rash was [illegible] it was petechial or purpuric. Fifty-two [illegible] recovered. The rashes with [illegible] hæmorrhages [illegible]. The rash came out early in the septicæmic stage [illegible] with the rose spots of enteric and was [illegible] present when the patient was first seen in some instances a hæmorrhagic rash recurred before death. Herpes was noted in [illegible] cases in 18 of these there was also a rash in 5 the rash and the herpes occurred together. In 13 the herpes followed the rash usually after an interval of four days. In a few instances the herpes extended to the ears or was very extensive. Serum rashes were mentioned in the notes of 19 cases but very likely were commoner than this, and in a few instances were accompanied by pains in the joints.

Strabismus was recorded in 21 cases; it was often transient or intermittent, but one man was invalided out of the Service for persistent diplopia. Of the 21 cases 12 proved fatal.

Photophobia was noted in 21 cases and conjunctivitis in 9, in 1 of which double hypopyon and blindness resulted. Optic neuritis was reported in 4 only but the number of cases examined was not large. Nystagmus was observed in 5 cases, and ptosis in 7 (6 fatal). Definite paralysis was noted in 16 cases hemiplegia being the most frequent (in 8 cases), then facial paralysis without hemiplegia (in 5 cases) bulbar paralysis palatal and pharyngeal paralysis were noted in 1 case each but the last two paralyses may easily have escaped observation in many cases. An extensor plantar response was noted in 11 cases, and was sometimes double, sometimes unilateral. Ankle clonus, opisthotonos and general rigidity were recorded in a few cases. Deafness was prominent in 11 cases (2 due to otitis). Pericarditis with friction and effusion was noted in one case that recovered and pericarditis was found in 3 other cases after death. Synovitis occurred in 8 cases, 6 of which recovered in 2 of these cases the meningeal symptoms were absent or very slight and it has been stated that the prognosis is good in cases with articular manifestations, because the joints receive the meningococci and so divert them from the meninges. The synovitis was usually multiple and transient and never suppurated. In addition 1 case had a synovial effusion after serum. Otitis was observed in 4 cases, 1 of which was associated with suppurative parotitis. In 2 cases (1 fatal) epididymitis occurred. Hæmaturia was noted in 1 case and melæna in another. In

2 cases clinically presenting the features of pneumonia, meningococci were found in the cerebro-spinal fluid at the necropsy, which also showed pneumonia. In another case of pneumonia, also at Deal and fatal, meningococci were found in the cerebro-spinal fluid obtained by lumbar puncture. These cases are important as showing that meningococcic infection may co-exist with pneumonia, for pneumonia may produce meningismus with a clear and sterile cerebro-spinal fluid. In one case of cerebro-spinal fever at Chatham, aspiration pneumonia was found at the necropsy. In one case pleurisy without pneumonia was observed clinically (no necropsy), and in another case severe broncho-pneumonia with a patch of pleurisy was found after death.

(IV) SUMMARY OF THE RESULTS OF TREATMENT

This summary is abstracted from the notes of 163 cases, 89, or 54.6 per cent., of which proved fatal. The prolonged and unsatisfactory cases naturally received more varied treatment than the fulminating cases, some of which died shortly after coming into hospital. As will be seen by the tabular statement, various forms and combinations of treatment were employed, and the most noticeable point is the failure of the generally approved intrathecal injection of anti-meningococcic serum.

Anti-meningococcic serum from various sources (Burroughs Wellcome and Co., the Lister Institute, Mulford (Flexner)), was employed.[1] In 105 cases the treatment consisted of lumbar puncture and intrathecal injection of the serum either alone (62 cases) or with the addition of vaccines, soamin, or hexamine (43 cases). Of these 105 cases 64, or 61 per cent., died, and 41, or 39 per cent., recovered. Of the 62 cases treated by lumbar puncture and intrathecal injection of serum death occurred in 43, or 69.4 per cent., and recovery in 19, or 30.6 per cent., whereas of 43 cases treated in addition by vaccines, soamin, or hexamine 20, or 46.5 per cent., were fatal, and 23, or 53.5 per cent., recovered. It is therefore obvious that the cases treated by the intrathecal injection of serum and especially those in which this was the only specific treatment adopted had a higher death-rate than that (54.6 per cent.) of the whole series of 163 cases. Flexner[2] has laid much

[1] In one case at Deal 10 c.c. of blood serum from a patient convalescent from the disease was injected intrathecally the day before death.

[2] Flexner, *Journ. Exper. Med.*, N.Y., 1913, vol. xvii, p. 553.

stress on the importance of injecting anti meningococcic serum intrathecally as early as possible in the disease and in a table dealing with 1 211 cases he shows that when the serum is injected

	Cases	Deaths	Per cent	Recoveries	Per cent
Anti-meningococcic serum—					
Intrathecally	105	64	or 61	41	or 39
Alone	62	43	69 4	19	,, 30 6
Combined with vaccines soamin hexamine or serum hypodermically	43	20	,, 46 5	23	,, 53 5
Combined with soamin	18	11	61	7	39
Combined with an auto vaccine	11	2	18 2	9	,, 81 8
Combined with hexamine	7	5	71 4	2	,, 28 6
Combined with serum hypodermically	7	2	28 6	5	,, 71 4
Hypodermically	19	6	31 6	13	68 4
Alone	4	1		3	
Combined with intrathecal injection of serum	7	2		5	
Combined with auto vaccine and intrathecal injection of serum	4	1		3	
Combined with an auto vaccine	3	2		1	
Combined with soamin	1	0		1	
Autogenous vaccine (never alone)	16	4	25	12	,, 75
Combined with serum intrathecally	5	1		4	
Combined with serum intrathecally and hypodermically	4	1		3	
Combined with serum intrathecally and soamin	1	0		1	
Combined with serum hypodermically	4	2		2	
Combined with soamin	1	0		1	
Soamin	43	19	,, 44	24	,, 56
Alone	21	7	,, 33 3	14	,, 66 7
Combined with serum intrathecally	18	11	61	7	,, 39
Combined with serum intrathecally and hexamine	1	1		0	
Combined with serum intrathecally and vaccine	1	1		0	
Combined with serum hypodermically	1	0		1	
Combined with an auto vaccine	1	0		1	
Lumbar puncture (alone)	13	4	30 8	9	69 2
Symptomatic treatment (only)	14	10	,, 71 5	4	28 6

within the first three days the mortality rate is 18 per cent , when between the fourth and seventh days 27 2 per cent and when later than the seventh day 36 5 per cent The following tabulation

of 105 cases treated in the Royal Navy has been made on the same lines for comparison —

	Cases	Deaths	Recoveries
1st to 3rd day	70	12 or 60 per cent	28 or 40 per cent
4th to 7th day	24	14 ,, 58·3 ,,	10 41 7 ,,
Later than 7th day	11	8 ,, 72 7 ,,	3 27 3 ,,

The failure of anti-meningococcic serum to reduce the mortality was therefore not due to its being given too late for in 66 7 per cent of the 105 cases it was administered within the first three days of the disease The serum treatment, which was so successful in America (Flexner, Sophian), Belfast (Robb), and elsewhere, was given a thorough trial and proved most disappointing In very few instances was there the critical improvement which is said to occur in about 30 per cent of the cases that recover (Flexner[1]) Possibly the meningococci were " fast " to the action of the serum or were para meningococci In consequence of its apparent inertness intrathecal injection of serum was in the latter part of the epidemic largely replaced by or combined with other methods, such as the intramuscular injection of soamin It is true that the mortality naturally diminishes towards the end of epidemics, and this may to some extent explain why, as shown by the tabular statement, the results of intrathecal injection of serum compare badly with those of almost all the other methods and combinations of methods There is, for example a remarkable contrast between the effects of intramuscular injections of soamin (a) when given alone to 21 cases with a mortality of 33 3 per cent, and (b) when combined with intrathecal injection of serum in 18 cases, with a mortality of 61 per cent It must be recognized that when dealing with small numbers fallacies easily creep in but merely from these figures the addition of intrathecal injection of serum would appear to have coincided with an increase of mortality in the cases treated with soamin The high mortality can hardly be explained by the suggestion that it was due to the bad effects of lumbar puncture, for in 13 cases in which lumbar puncture alone was employed there were 9 or 69 per cent, recoveries and in 91 per cent of the 163 cases lumbar puncture was performed, and in many cases repeatedly, to relieve symptoms referable to increased intrathecal pressure Alarming symptoms directly after the intrathecal injection occurred in 2 cases only, thus showing that the gravity method of administration which was not in vogue in the Royal Navy, is hardly necessary provided due care be taken

[1] Quoted by Herman and Lebisken 'Meningococcus Meningitis, 1913, p 282

Anti meningococcic serum was given hypodermically in 20 cases but as in 4 cases only was it the sole form of specific treatment employed, no conclusions as to its influence can be drawn

An autogenous vaccine was given in 16 cases, mainly by Fleet-Surgeon H C Whiteside, R N, at Plymouth, where the mortality (36 7 per cent) was remarkably low The cases to which auto vaccines were given all received other specific remedies (in 11 cases intrathecal injections of serum) and showed the very low mortality of 25 per cent But as the numbers are small this result—though a further stimulus to its more extended use—must not be insisted on

As already mentioned, soamin appeared to give good results its beneficial effect in the septicæmic stage of the disease was noticed by Staff Surgeon B S Robson, R N., at Haslar, and has also been mentioned by others[1] In one case at Portland Hospital as much as 42 gr of soamin were given Optic atrophy was not noted in any instance

Hexamine was given by the mouth in 7 cases in the hope that as it is secreted into the cerebro-spinal fluid, it would exert a bactericidal action on the meningococci but as it did not appear to have any effect clinically it was soon abandoned

Lumbar puncture which is such an important means of diagnosis, was performed in 149 out of 163 cases, or in 91 4 per cent In 38 cases lumbar puncture was done once only, but 14 of these cases died soon after they came under observation 6 other cases tapped once died Of 22 cases, tapped twice 8 proved fatal, 2 being very acute 3 tappings were done in 20 cases (9 deaths), 4 in 24 (15 deaths), 5 in 15 (9 deaths) 6 in 6 (3 deaths) 7 in 7 (4 deaths) 8 in 3 (2 deaths) 9 in 4 (all fatal) 11 in 5 (2 deaths) 13 in 1 (fatal) 15 in 1 (fatal) 16 in 1 (fatal), and 17 in 2 (both recoveries) Lumbar puncture appears to be a palliative rather than a curative remedy and to relieve for a time symptoms due to increased intra thecal pressure In 13 cases, of which 4 proved fatal it was the only form of treatment other than the ordinary symptomatic remedies employed

In 14 cases, 10 of which proved fatal, symptomatic remedies only (such as morphine for pain) were given

[1] Batten *Lancet* London 1915 vol i p 986

(V) RECOMMENDATIONS AS TO THE PREVENTION (i) OF CEREBRO-SPINAL FEVER AND (ii) OF ITS SPREAD

(i) *In order to Prevent the Appearance of the Disease* the ideal is obviously to avoid the introduction of carriers into barracks, establishments, and ships; but as it is impossible to examine bacteriologically all the men at such frequent intervals, so as to detect intermittent carriers (*vide* below), this cannot be attained.

Before the occurrence of cases and the isolation and examination of their contacts, the only promising procedure for the detection of carriers would be bacteriological examination of swabs from boys or men who for the following reasons—the presence of nasal or pharyngeal catarrh associated with headache or fever, or the occupation of overcrowded quarters—might possibly be carriers. The boys' training establishments, especially those such as the "Impregnable," the "Powerful," and Shotley, where outbreaks have previously occurred, are more likely to harbour carriers and originate cases of the disease. It might therefore be advisable to examine bacteriologically those boys who develop catarrhal symptoms. This investigation should be undertaken some little time before an epidemic may be expected and, judging from recent experience, the most suitable time would be in the month of December. In order to avoid the risk of intermittent carriers, namely, those who are alternately positive and negative bacteriologically, *it would be advisable to invalid out of the Service all those who have recovered from an attack of cerebro-spinal fever.* It is true that such persons have usually been proved to be negative before leaving the hospital, and that the carrier state generally lasts for a short time only—commonly three weeks. On the other hand, periodic or intermittent carriers are known to exist, and if these can be eliminated at the comparatively small cost of invaliding those who recover from the disease (about 74 would be the loss between August, 1914, and August, 1915), a distinct advantage would be gained.

Overcrowding should be prevented, and a cubic space of 800 ft. per man when the men live, mess, and sleep in the same room, and of 600 cubic ft. when they sleep only in the room, should be maintained. Steps to remedy the overcrowding in the "Impregnable" and "Powerful," and at the Royal Naval Barracks, Devonport, should be taken without delay. Further, when catarrhal diseases break out, the cubic space should be increased by diminishing the number of men in the infected rooms. Constant and adequate

ventilation of the sleeping rooms should be [illegible] the system of night patrols, who see that the windows and ventilators are not closed during the night

As recent recruits are specially picked out by the disease the depressing conditions to which they are liable should as far as possible be mitigated The risk of over-fatigue from unaccustomed drills and route marches should be borne in mind, and especially avoided after vaccination or antityphoid inoculation

As catarrhal disease, such as influenza catarrh, tonsillitis, and sore throat appear to play some part in favouring the outbreak of cerebro-spinal fever, and often precede its appearance and coincide with its prevalence every effort to limit their spread should be made Special care should be taken to prevent the common use of handkerchiefs and towels Isolation when possible should be carried out and, as already mentioned, the cubic space in the infected rooms should be increased The throats and noses of the patients should be douched or sprayed with a mild antiseptic lotion, such as warm solution of permanganate of potassium 1 in 1,000 When convalescent the men should be carefully protected from fatigue

(ii) *Measures to Prevent the Spread of Cerebro-spinal Fever when the Disease has appeared*—During the late epidemic this problem, which is rendered specially difficult by the exigencies of the Service in war time, was thoroughly taken in hand, and it is therefore unnecessary to reiterate the details and the established routine such as the closing and disinfection of the dormitory in which a case occurs the sterilization of the clothing, beds, mattresses, pillows, sheets, blankets, towels of the patient and of his immediate contacts, and the isolation and bacteriological examination of contacts

The evidence that carriers spring up freely around a case has raised the question if the usual number of contacts sent for bacteriological examination—namely six (the two who sleep and the two who mess on each side of the patient, and his two most intimate friends)—is sufficiently large to catch all the infected contacts Examination of remote contacts has therefore been carried out in some instances in which isolation of close contacts did not arrest the outbreak The success which attended this step at Plymouth and Chatham (*vide* pp 375, 376) justifies the belief that a more extended examination of contacts is desirable This extension might consist in inspection of the remote contacts in the same dormitory and mess-room, and the isolation of those found to have naso pharyngeal

catarrh until they have been swabbed and proved bacteriologically not to be meningococcic carriers A list of the friends of the patient might also be made the basis for an extension of the examination of contacts It would probably be wise to examine ten to twelve contacts as a matter of routine, even when an isolated case occurs When the contacts are isolated it would be advisable to segregate those with naso-pharyngeal catarrh—and therefore more prone to be carriers—from those in ordinary health This would tend to prevent the extension of the carrier state among the contacts during their ten days of quarantine Contacts, and especially carriers with catarrh should be instructed not to swallow the naso-pharyngeal mucus which should be carefully collected and burnt The urine should be dealt with so as to avoid any risk of infection from this source

The douching of the nose and throat of contacts and carriers twice or thrice daily should be carried out under medical supervision, and it is important that mild antiseptics only, such as warm permanganate of potassium solution, 1 in 1,000, dilute saline solution, or dilute boracic acid solution, should be employed, and that the more powerful antiseptic solutions, which may impair the resistance of the naso-pharyngeal mucous membrane and so favour persistence of the carrier state or lead to cerebro spinal fever in a carrier, should be avoided The isolated contacts and carriers should sleep in well-ventilated wards, rooms or tents with ample cubic space, should be as much in the sun and fresh air as possible —exposure to cold, east and north-east winds being avoided—receive a generous diet, and their general hygiene should be carefully supervised As long as the contacts are isolated in good circumstances, it is not essential that they should be actually in hospital, and a camp or buildings, preferably in the neighbourhood of a medical establishment, would meet the case

When an outbreak of cerebro-spinal fever is recognized, any case even possibly of this nature such as toxaemia and severe influenza, especially of the nervous or gastro-intestinal types, should be isolated from the sick bay and catarrhal conditions, such as influenza, catarrh, tonsillitis, and sore throat, dealt with in the manner described above

It is advisable that swabs from the throats of the surgeons nurses, and sick berth staff in attendance on the patients should be periodically examined so as to detect carriers and that cases of catarrh, sore throat, malaise, or headache among those in contact with the patients should be promptly isolated and examined

bacteriologically, as some of them may be examples of abortive cerebro-spinal fever. Lieut M Culpin, R A M C, F R C S, has mentioned to me cases of this abortive form of the disease among the orderlies in the wards for cerebro-spinal fever at the Alexandra Hospital, Cosham

The arrangements for the quarantine of men before being drafted from infected barracks have been amply justified, for it is most remarkable that from the beginning of the War until August 1, 1915 there were only twelve cases on sea-going ships In the light of this successful result the quarantine, which leaves a wise margin for variation in the probable length of the incubation period, should not be relaxed

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THE USE OF HYPOCHLOROUS ACID AS AN ANTISEPTIC IN THE NAVAL MEDICAL SERVICE

By Surgeon H. E. R. Stephens, R.N.

Of all the antiseptics in general use at the present time not one can be described as perfect. Each possesses in one form or another an undesirable quality which limits its sphere of action. The more powerful germicides are too irritating or even caustic, the milder ones are usually ineffective owing to their lack of bactericidal power, while others give rise to symptoms of toxic absorption. Consequently the introduction of an antiseptic which is extremely potent, yet non-toxic and non-irritating, is an advance of vital importance to all and to the Naval Medical Service in particular.

As a result of experimental work performed under the direction and powers of the Research Committee of the National Insurance Act, the value of hypochlorous acid as an antiseptic has been brought into prominence by Lorrain Smith, Murray, Drennan, Rettie and Campbell. It is entirely due to their permission that the following results are recorded.

At the outset it may be as well to point out that the application of chlorine and oxygen to overcome sepsis is no new invention. As long ago as 1846, Semmelweis, the first to apply antiseptics in midwifery, stamped out an epidemic of puerperal fever in Vienna by the use of bleaching powder. Eau de Javelle has long been recognized as a powerful disinfectant, especially when freshly prepared. In all Pharmacopœias of the present day solutions of chlorinated lime, chlorinated soda, and peroxide of hydrogen find a place. Hitherto their practical adaptation to modern surgical technique has failed, though the power of chlorine and oxygen as germ destroyers has never been disputed.

"Eupad" and "eusol" are the names given to the new powder and solution respectively. The former is prepared by simply mixing in a mortar equal parts of *dry* boric acid and *dry* bleaching powder. The fact that the two ingredients should be free from moisture is emphasized, otherwise a reaction occurs and the strength of the powder is diminished. A good brand of bleaching powder should be used, such as that manufactured by Steele, Victoria Street, Glasgow. This has always proved reliable. It is put up in convenient ½ lb. packages which cost 1d.

Preparation of eusol Add 1 oz of bleaching powder to 40 oz. of water The large earthenware jar supplied to the Service afloat containing methylated spirit has been found most suitable Shake vigorously Add 1 oz of boric acid Shake again Add another 40 oz of water Allow to stand for several hours Shake occasionally Filter through a coarse cloth The resultant clear fluid is the antiseptic solution ready for use

When bleaching powder is added to boric acid and the mixture is moistened, hypochlorous acid is given off as a gas If the water is in excess the gas goes into solution Eusol is merely a solution of hypochlorous acid approximately 0 5 per cent strength This, being relatively stable, has been found to be the most suitable Stronger solutions are apt to lose strength. This one remains efficient for a period of three to four weeks

As an example of its power as a germicidal agent we may instance the two following experiments —

(*a*) Anthrax spores are not killed by a 1 in 20 carbolic acid solution under twenty four hours

(*b*) Under similar conditions the 0 5 per cent solution of hypochlorous acid killed anthrax spores under two minutes

Such a marked superiority is hardly capable of belief were it not a fact Here it may be mentioned that in addition to testing the germicidal power on cultures, pieces of putrefying *post-mortem* intestine, both adult and infantile, were used The result of all these experiments has placed beyond dispute the fact, that in the combination of nascent chlorine and nascent oxygen we possess the most destructive means at our disposal against the lower organisms which infect the body

That hypochlorous acid when brought into contact with the tissues in this strength does not produce any toxic effects is not to be wondered at when its composition $HClO$ is considered The blood and lymph are solutions of sodium chloride in which the tissues are bathed Hydrochloric acid itself is manufactured by certain cells for a specific purpose The ions of chlorine and oxygen are of vital importance to metabolism A natural antiseptic appears within the range of possibility It is difficult to realize that this combination of chlorine and oxygen, while acting as a deadly poison to the lower organisms, does not appreciably injure the living cells of the body There must exist some fundamental physiological difference between the microbe and the animal cell to explain this anomaly

The following brief summary of the clinical results is given

We have used eusol as a general antiseptic solution in H M S "Lion" since June 11 1915

Septic Wounds—The routine has been to wash all fresh wounds freely in eusol No sign of pus was seen subsequently From the base surface serum oozed out when redressed It is unnecessary to remove the bandage as the solution can be simply poured on the dressing A specific ulcer cleaned rapidly under its influence. From our experience, limited though it is, the general results from wounds of all descriptions has been to bear out fully the experimental investigation

Boils—After incision these were syringed out with the solution A wick of gauze impregnated with eupad was inserted, they cleaned rapidly. Whitlows were treated in a similar manner

Follicular Tonsillitis—The 0 5 per cent solution appeared more effective in removing the sloughs than the local application of lotio hydrarg perchlor 1 in 1,000 A eusol gargle diluted 1 in 5 was also used It is suggested that this might prove a useful spray to disinfect the nasopharynx on account of the gaseous nature of the antiseptic This might be of special value in preventing the spread of cerebro-spinal fever

Sore Throat—These cases were treated similarly to those of follicular tonsillitis with similar results

Pyorrhœa Alveolaris—The most remarkable feature was the instant disappearance of the heavy sweet fœtor of the breath in these cases The gums took on a healthier appearance and the discharge of pus was considerably diminished Hypochlorous acid appears to be a very efficient weapon against oral sepsis

Impetigo Contagiosa.—An ointment 1 in 5 made of eupad and vaseline has been found effective

From the results obtained clinically over a period of two and a half months we may summarize the advantages and disadvantages, taking the latter first

Disadvantages—(1) Both powder and solution must be kept in stoppered bottles in a cool place out of light (2) The solution readily attacks metallic instruments and fabrics of all descriptions (3) If used in closed compartments the ventilation should be efficient

Advantages—(1) An extremely powerful antiseptic (2) Its effect is purely local There are no toxic decomposition products. Therefore it can be used in bulk over a large area This is a point of the greatest importance in dealing with severe multiple injuries. (3) It is extremely cheap, costing one penny per gallon—at least

150 times less expensive than iodine. (4) Simple to prepare. (5) Does not irritate the wound. A slight tingling sensation may be experienced, but as a rule this passes off in a few minutes. If a eusol compress be applied for a long period, there may be some oedema in the skin surrounding the wound. This may be prevented by a vaseline smear. There is always a flow of lymph from the wounded surface and this forms a natural means of cure. (6) The antiseptic action being a gaseous one penetrates deeper than solutions.

SURGICAL TECHNIQUE ON BOARD THE ROYAL NAVAL HOSPITAL SHIP "DRINA."

By Staff Surgeon R J WILLAN MS, FRCS Eng RNVR

Hon Assistant Surgeon, and Lecturer in Clinical Surgery to the Royal Victoria Infirmary Newcastle on Tyne.

This monograph has been divided into four sections namely —

(1) A description of the operation theatre

(2) A description of its contents

(3) The preparation of a patient for an operation

(4) The operating technique

The writer's endeavour was to carry out exactly the same operating technique that he uses in his everyday civil life, to fit out an operating theatre *de novo* for the attainment of this was by no means an easy task, for so many of the accessories required were non service ones For the benefit of anyone who might happen to be interested, I have ventured to give, wherever possible, full details of measurements for the most of the fittings described can be readily made in any ship flying the White Ensign I am indebted to Surgeon R H Jolly, RNVR, for his kindness in taking the photographs

Section I

The operating theatre under my charge is situated in the open on the after end of the upper deck There is a similar theatre forward, this is closed at present, but can be readily re opened if the necessity arose Each theatre is adjacent to the upper end of a lift respectively which leads to a ward

The theatre is constructed of wood and is clamped to the deck, the floor only is tiled It is divided into two compartments a preparation room and an operating room, by a sliding door Each room can be separately entered from the outside through wide double doors opening outwards These two separate entrances are to save valuable time during a rush of operating work, e.g, a patient is anæsthetized upon a table in the preparation room, and is ready for conveyance to the operating table immediately this has been vacated (*via* the exit direct to the outside) by the previous patient Each room has an electric radiator for heating

For artificial lighting two separate ' clusters of electric lamps are suspended from the roof Each cluster is supplied from a *different* dynamo, in case one of the latter went wrong during an

operation which was being performed at night. This theatre proved adequate in every way during the early months of the War and the results obtained were excellent, all "clean" operation wounds healing by first intention.

With the advent of the cold weather however it was found that the patients frequently developed an acute bronchitis after an operation, due to the necessity of transporting them (sometimes in the rain) through the open air to the upper end of the lift *en route* for the ward. To get over this difficulty the kitchen of the ward, where all operation surgical cases are housed, was converted into a temporary winter theatre. This kitchen is merely a corner partitioned off from the ward itself by deal boarding.

The temporary winter theatre had the great advantage of being so close to the ward, but it also had its drawbacks. It contained a hot press (for keeping food &c., warm) heated by steam, which raised the temperature of the room to such a degree that on some occasions it reached as much as 95° F. during an operation. In addition to the extreme discomfort to all in the theatre, the results of the wounds were not so good as they had previously been. In three cases wounds which should have healed by first intention did not do so. Eventually I traced the cause to be due primarily to the great heat in the theatre; this dried up the debris so completely that dust was created, and the latter being stirred up by local draughts of air, such as persons moving about, undoubtedly infected the mops and ligatures. Antiseptic lotion sprayed on the deck was of little use here on account of its slope. After removal of the hot press the results, with exactly the same technique, were excellent.

Briefly, a combined antiseptic and aseptic technique is used. An all-dry aseptic technique can only be successfully carried through under ideal conditions. The operation theatre conditions on board this hospital ship, although good, are not ideal, and I therefore feel confident that any technique which does not include antiseptics in its detail is running risks which are not justifiable.

The operating surgeon, theatre sister, operation assistant, and instrument assistant all wear caps and masks, also sterilized gowns, sleeves and india-rubber gloves. The patient is completely covered with dry sterile towels excepting the operation area. In addition to this a towel wrung out of a 1 in 20 solution of carbolic acid, for resting the surgical instruments on, covers a portion of the other towels. The surgical instruments, after boiling, lie in a 1 in 40 solution of carbolic acid. Mops used during the operation are kept in a hot solution of normal saline.

Section II

A supply of sterilized water, both hot and cold, is available by boiling tap water in two copper cylinders. These cylinders are identical: each has a capacity of sixty pints, a well-fitting lid, also a tap at the lowest extremity projecting laterally, and there is a vertical glass gauge to register the level of the fluid inside. One cylinder is marked "cold," the other being marked "hot." Each rests on a separate four legged metal stand 24 in. from the ground, 9 in. from the top of this stand is an iron platform for a Primus stove to rest on. The lid is kept secure from the attentions of the unwelcome enrions by tying on a jaconet cover. The acquisition of these water sterilizers very much increased our efficiency, now we can ensure a supply of sterile water for making lotions and for the irrigation of a peritoneal cavity, &c. Boiled water could previously only be obtained at great inconvenience, because the ship's galley, the only available place in the ship with an open fire, was so inaccessible.

For a single operation the operating staff of four persons require sterilizing, four linen gowns, four waterproof aprons, four pairs of linen sleeve armlets, and four waterproof sheets (each one the size of an ordinary towel) for putting around the operating area, together with six towels. The waterproof material used for aprons and sheets is battiste sheeting; unlike ordinary jaconet, this will withstand the heat required during sterilizations.

The sterilizing of the foregoing is done in oblong shaped boxes measuring $11\frac{1}{2}$ in. by 10 in. by 8 in. (see fig. A). Circular sterilizing boxes perhaps look nicer, but the oblong boxes of the same height and width hold such a great deal more. These boxes are made of a patent metal composition, which almost indefinitely withstands the wear and tear of constant sterilizations. Fitted inside the box is a detachable wire basket to hold the contents to be sterilized; this basket rests on four loops of wire which prevent its whole floor from resting on the bottom of the box. During sterilization the lid is held open by a small adjustable metal slide inside the box; the heated air, therefore, has free access to every side of the contents of the wire basket. The contents of each box are indicated on a tally made of battiste sheeting; this is affixed to the handle.

Our sterilizer, which is worked by steam, is housed in an annex of the forward theatre. It is made by Manlove, Alliott and Co.

Although we are most fortunate in having such an excellent sterilizer, no means are provided for ascertaining whether it is

[illegible] efficiently. Experience shows by the test employed that owing to even a small faulty detail of technique the necessary heat *inside the sterilizer* has sometimes not been attained, and that the contents of the tin could not be sterile. To bring such towels, gowns and sleeves (perhaps badly contaminated at a previous septic operation) in contact with an operation wound is inviting a serious disaster. The only safe way is to ascertain definitely that all the boxes used have sterile contents; this can only be done by testing the result of each sterilization. The test is employed upon one box in each lot sterilized, for if the contents of one are sterile all must be so.

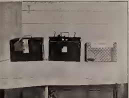
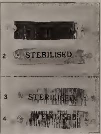


Fig. A. [illegible] the sterilizing boxes [illegible] the wire basket for holding the [illegible] gowns [illegible] a box with the lid held open [illegible] and a box closed and sealed with its contents ready for use. To the handle of the latter is attached the [illegible] its contents [illegible] paper label forming the seal is also shown [illegible] the wire basket.

The test consists of an oblong piece of white paper 4 in. by 1 in. with the word "sterilized" printed in large type across one side. The printed side of the "paper" is smeared with a mixture of starch, 1 oz., iodine, 7 gr., pot. iodide 7 gr., water to 10 oz.; this when dry almost completely hides the lettering underneath a brownish-black coating (see fig. B, 1). This test paper is placed

in the middle of the wire basket inside the box, being surrounded on all sides by its contents. If the middle of the box (*i.e.*, the site of the test paper) has reached a temperature of 113° C., the test paper becomes decolorized and the printed word "sterilized"



[illegible] the sterility of the contents of [illegible] middle of the contents [illegible] the ghost of the printed word [illegible] a test paper after it has [illegible] temperature of at least 113° C. has [illegible] and 4 are incompletely bleached, i.e. the contents of [illegible] been subjected to a temperature of 113° C. [illegible] these contents [illegible] sterile and were therefore unsafe to use at an operation.

appears on a white background (see fig. B, 2). If the required heat of 113° C. has not been obtained the test paper will remain its brownish black colour, or perhaps be only partially bleached (see fig. B, 3 and 4). Should the test label not be completely bleached, I use for the operation towels wrung out of a warm 1 in 40 solution

of carbolic acid. A good stock of these carbolic towels are kept in a storage jar.

My colleague Mr. G. Grey Turner, introduced this excellent and simple sterilization test to the Newcastle-upon-Tyne Infirmary. He informs me that he saw the method in use in the clinic of Professor Garre, at Bonn.

After removal from the sterilizer the boxes are closed by securing the fastening catches and a printed label is pasted across the junction of the lid with the box to form a seal. The wording on this printed label reads "Sterilized. This box not to be opened until required for use" (see fig. A). The fact of the label being torn across is a reminder to all that the contents of that box are not free from the suspicion of contamination by having been opened; the box is not unsealed until the actual time of usage.

The theatre sister packs the boxes while the actual sterilizing is carried out by the theatre attendant.

Catgut only is left inside wounds; silkworm gut and horsehair are used for approximating the margins of the skin, while a sterilized stock of china twist silk is kept ready for use.

A sterilized supply of catgut is kept, four sizes, Nos. 0, 2, 4 and 7 being stocked. For convenience these are arranged on different coloured glass reels, namely, No. 0 on a green reel, No. 2 on a glass coloured reel, No. 4 on a blue reel, and No. 7 on a white reel. The surgeon readily gets used to associating the different thicknesses of catgut with the correct colours and asks for ligatures or sutures from reels of the particular colour. As a reminder to both the surgeon and the instrument assistant, a list of the colours associated with the different thicknesses is hung up on a side of the instrument table (see fig. D).

Raw unmedicated catgut is converted into sterilized catgut on board by Jellet's method. Under antiseptic precautions the catgut is wound on the glass reels, which are then placed in a Jellet's catgut sterilizer. After covering these reels with absolute alcohol the top of the strong brass cylinder is screwed down. Twenty-four hours later the absolute alcohol is poured off and replaced by a fresh supply of the same fluid. After screwing down the top very firmly, the cylinder is completely immersed in a pan containing *cold* water, which is very gradually brought up to boiling point, two hours being the time necessary for this stage. Boiling point is maintained for half an hour, after which the heating agent is removed and the water with the contained cylinder is allowed to cool down. When the cylinder has cooled down it is opened

and the reels are transferred under antiseptic precautions to the wide-mouthed glass storage jars which have accurately fitting lids. Fig. C shows a Jellet's sterilizer, also a storage jar containing some sterilized reels of catgut. These storage jars contain a solution of 1 in 20 carbolic acid but methylated spirits are used for making up the solution instead of water. The catgut is now ready for use. If it has been prepared according to the recipe, a strong pliable sterile suture and ligature material is obtained. If it is boiled or

FIG. [illegible] theatre sister dressed [illegible] for an operation. Upon her left are shown [illegible] (mask) [illegible] the stock jar [illegible] the spirit corrosive gauze (2) [illegible] a small gauze [illegible] (3) and a gauze drum (4) each with its tape and [illegible] the top shelf [illegible] Jellet's catgut cylinder (5) and a glass storage jar [illegible] of catgut of different sizes (6) [illegible] the bottom shelf [illegible] storage with infusion needle ready attached (7) [illegible] jar holding sterile [illegible] rubber drainage tubes (8)

cooled too quickly, brittle catgut is the result. The great pressure exerted by the superheated absolute alcohol (it boils at 173° F.) fully penetrates the whole thickness of the catgut, rendering it sterile.

Silkworm gut and horse-hair are each boiled for ten minutes while silk is boiled for twenty minutes. Sizes No. 1 and 6 of China twist silk are stocked. These are all kept in the same wide-mouthed storage jar; half an hour before an operation sufficient

carbolic acid (1 in 20 solution) is poured into the jar to cover the contents, at the conclusion of the operation this lotion is drained off. When not in use the glass lids of the ligature and suture jars are anchored down by a jaconet cover.

For any operation cases where there is any cavity, which might harbour a lost mop, special mops are used. These are made by the theatre sister from unmedicated white gauze, which is folded to make thirty-two single layers. Mops in three sizes are used: (1) 4 in. square, for ordinary use; (2) 10 in. square, for packing off intestines, isolating the margins of the wound, covering large raw surfaces, &c.; (3) strips 24 in. long and 2½ in. wide, for packing into cavities, leaving in as a drain, &c. Firmly sewn to one corner of each mop is a tape 14 in. long: to this tape is attached a heavy porcelain ball (in size rather smaller than a golf ball) which is perforated through its middle. These were introduced several years ago by Professor Rutherford Morison of Newcastle-upon-Tyne. The porcelain balls hang out of the wound at the end of the tape and are a great additional aid to the prevention of what Mr. Morison terms "mopitis," i.e., the results of the great surgical disaster of the accidentally leaving in of a mop at an operation. Each kind of mop, all complete with tape and ball attached, is tied up in bundles of five, and each variety is stored separately in jars. Not being provided with proper storage jars large glazed butter jars were improvised: the lid is wrapped in a towel wrung out of a 1 in 20 solution of carbolic acid, while to further render it dust-proof its top is covered with a well-fitting cover of jaconet tied securely round the neck of the jar. The contents of each jar are plainly painted on the outside. Fig. C shows a small mop and a strip each with tape and ball attached. It also shows the storage jars used for the sterilized stock of mops.

The bundles of mops, with porcelain balls attached, are sterilized by boiling in water for thirty minutes, after which they are antiseptically transferred to the storage jars which contain a 1 in 10,000 solution of hydrargyrum perchloridum. If the operation case is a clean one the mops used are washed and re-sterilized; if the case is a septic one the porcelain balls are detached for further use and the mops are destroyed.

To those surgeons who are not accustomed to using these balls, or who perhaps have never seen them, they may appear to be cumbersome. This, however, is not so, for one quickly gets used to them and they become just as easy to manipulate as an ordinary mop. The peace of mind they give to the surgeon far outweighs

any trouble the balls and tapes cause him If mops are accidentally left in a wound it is usually at an emergency operation, when the patient is very ill and speed is of great moment As most of the operative work afloat is emergency surgery, I think therefore, that extra precautions have to be taken with the mops Those counting the mops are only human and mistakes in the "count" can be made Having the balls which hang out of the wound is an additional precaution, if a mistake were made in the count and if a mop with its tape and ball *did* get hidden in the depths of the wound the matter could quickly be cleared up later by taking a radiograph for the ball would give an excellent shadow Without such information the presence of a mop accidentally left in might be surmised but could not be proved for, of course, the gauze mop itself is transparent to X-rays

That such mistakes are occasionally made is common knowledge to the members of the honorary staff of any large general hospital While a surgical registrar I saw three different patients admitted in one month who had had mops left in at operations elsewhere, these were diagnosed and removed in each case by Professor Morison

Operation wounds are dressed with "spirit perchloride" gauze The rolls of unmedicated gauze are boiled for thirty minutes and then stored in jars containing hydrargyrum perchloridum 10 gr to each pint of methylated spirits

Everyone in the theatre during an operation wears a cap a mask and a gown The cap is a circular piece of linen 14 in in diameter and with turned-over ends at the circumference to form a slot to take a running piece of tape The two ends of the tape project from the same small aperture and tightening them converts the flat piece of linen into a cap In the middle of the cap is a hole 1½ in in diameter, to add to the comfort of the wearer's head if the theatre is hot The mask is an oblong piece of linen 6 in by 3 in with tapes 18 in long sewed to each corner This mask covers the mouth only the nose remaining uncovered The cap certainly is a protection against loose hair or a piece of scurf falling into the wound just as the mask also protects the wound from any mouth spray reaching it from the operator or a loquacious spectator Neither cap nor mask is sterilized The gowns are the ordinary Service ones the sleeves are shortened to enable sleeve armlets to be used It is impossible to provide a fresh sterile coat for each member of the staff for every operation when there are several consecutive ones, the next best thing is to provide each of them with a fresh pair of sterile sleeve armlets for every operation, and this is done

[illegible] n for the sterilization of the bowls, dishes and [illegible] in operation, but one of the many well wishers [illegible] kindly obtained for us a large oblong shaped [illegible] ing 21 in long, 18 in wide and 14 in deep which will [illegible] all the bowls, &c required for an operation It has a [illegible] 14 and in the inside one inch from the top a brass [illegible] on its under surface projects inwards and obliquely [illegible] all around for 1 in this helps to prevent any splashing [illegible] there is a small roll on the ship From the front of the tank [illegible] the bottom projects a brass tap for convenience of emptying It fits into the top of a wooden frame 15 in high It is kept filled with a 1 in 20 solution of carbolic acid and therefore is always [illegible] ready for use

A [illegible] electrically heated sterilizer is provided for sterilizing the surgical instruments It is 19 in long 12 in broad, and 4½ in deep in its inside measurement Its only disadvantage is that it takes a full half hour to boil even when hot water is first put in It stands upon a metal topped table adjacent to and on a level with, the top of the instrument table in order to be handy for re sterilizing instruments during an operation In case this sterilizer fails, one heated by methylated spirits is kept in reserve

As there is a thorough current of air in the theatre when both doors are open great care has to be taken that the surgical instruments surgical mops, ligatures &c do not become contaminated with dust when a door is opened To reduce this danger to a minimum two identical wooden tables 31 in high were made The carrying surface of the table measures 36 in by 18 in and securely fixed, and projecting upwards all round the sides of the table top is a continuous sheet of brass 7½ in high A draught free well is thus produced the floor of this being the wooden table top and the sides of brass On the upper margins of the brass sides of each table are two stout brass rods with towel-over ends these are boiled in the sterilizer and are to prevent the carbolic towels which form the roof of the box, from sagging downwards into the contents of the box Figure D gives a side view of one table while above this the other table is seen laid upon its side in order to give a view from above

The mop table' holds two 20-pint capacity enamelled bowls for the mops also a long narrow enamelled tray with lid to hold the instruments required by the sister during an operation

The instrument table holds an enamelled tray 17 in by 15 in and 2½ in deep for the surgical instruments, a glass tray 7½ in by

$6\frac{1}{2}$ in by $1\frac{3}{4}$ in with [illegible] pus, with with [illegible] ligatures and [illegible] perchloridum solution

The lotions stocked in the theatre are carbol [illegible] 1 in 20 solution hydrargyrum perchloridum 1 in 500 [illegible] 000 solutions and concentrated normal saline solution

[illegible]

For convenience [illegible] stocked concentrated solution of [illegible] so that 1 oz of same added to 1 pint of water makes normal saline solution (i.e. 1 dr to 1 pint of water) This concentrated solution is stored in flat

[illegible] ether bottles which are corked and have a hood [illegible] loosely over same These bottles are almost [illegible] in the sterilizer and are boiled up, as required [illegible] contents, the cork soon works loose, but is prevented [illegible] by the overlapping hood When sterilization is completed the underlying cork is manually manoeuvred into the [illegible] of the bottle In practice we have found this much more satisfactory than using the sodium chloride tablets, as the latter take so long to dissolve and in any case they have to be boiled up before they can be considered sterile

Sterilized india-rubber drainage tubes of various sizes are kept in a wide-mouthed glass jar containing carbolic acid 1 in 20 solution

The spirit soap used for scrubbing up the skin is made on board by boiling together soft soap 8 parts methylated spirits 1 parts water 1 parts Only the best soft soap should be used, otherwise the solution is unsatisfactory

A separate small tray holding two india-rubber gloves, a small pepper castor containing French chalk, a pot of vaseline, and a pot of soft soap is always kept ready in case the surgeon wishes to make a rectal examination

For bandaging up an abdominal case I use a "many tail" bandage made from three strips of flannelette the lowest strip (i.e. the one to be nearest the perineum) is 7½ in wide the other two strips being 6 in each in width These strips are made to overlap about ¾ in and are sewn together at the portion which lies over the patient's vertebral column

For thigh and groin cases flannelette roller bandages 6 yards long and in two widths 6 in and 4 in are used These flannelette bandages are very satisfactory, they are made on board, they are cheap they will wash they are comfortable for the patient, and they are durable Further the danger from the material igniting is nil for there are no open fires in the ship and no smoking is permitted under any circumstances in the wards A cystoscope a catheter cystoscope and a urethroscope are kept in the theatre, the illumination being obtained from an eight volt electric accumulator

Section III

With regard to the general preparation of the patient for an operation, if there is time for any preliminary preparation he is given oleum ricini 1 oz overnight followed by a copious soap and water enema at least four hours before the time of the operation

Should there be any question of acute appendicitis neither purgative nor enema is given on account of the danger of the [illegible] in the cæcum helping to cause a perforation of the appendix. A few hours before the time of the operation a cup of beef extract is given. A mouth-wash of carbolic acid 1 in 80 solution is used frequently prior to operation, and if there are many septic dental stumps these are also touched up with tincture iodi. This *must* aid in the prevention of lung sepsis during the stage of general anæsthesia. Half an hour before an operation, morphia gr. [illegible] with atropine gr. $\frac{1}{150}$ is injected hypodermically.

In the local preparation a wide area of skin is prepared. After any necessary removal of hair, the skin is thoroughly well scrubbed with spirit soap and hot water, followed in sequence by the application of turpentine, methylated spirits and hydrargyrum perchloridum 1 in 1,000 solution. A large compress soaked in the latter solution is applied, and this compress is changed a few hours before the time of the operation. If, however, the operation is upon an emergency case, the area is dry shaved and Harrington's solution is applied just before the actual operation begins, without any other preliminary local preparation. After leaving Harrington's solution to act for two minutes a little absolute alcohol (or methylated spirits will suffice) is applied. If the best results are to be secured from Harrington's solution it must be applied to a *dry skin*, for it can only satisfactorily penetrate to the deep layers of the skin if it can freely travel between the individual skin cells, which may be compared to multiple layers of house tiles. If the skin cells are already sodden, the spaces between them are constricted and they do not permit the onward passage of the antiseptic solution to the deeper layers. The formula of Harrington's solution is:—

℞	Sp. vini rect.	64 fl. oz.
	Acid hydrochlor. conc.	6 "
	Hydrargyrum perchloridum	35 gr.
	Water	30 fl. oz.

The hydrochloric acid gives finely divided particles of mercury which settle in the deep layers of the skin and forms a most efficient germicide. It is important to remember that this strong antiseptic must not be slopped about, for if it gravitates to the most dependent part where it may remain for any time in contact with the skin, it will produce a severe burn. I first made the acquaintance of this powerful skin antiseptic at the Mayo Clinic at Rochester, U.S.A., in 1909. After a prolonged trial of its use (without any

[illegible] general hospital [illegible] for [illegible] wounds [illegible]

Two [illegible] enamelled soap dishes [illegible] sterile [illegible] placed together in front of [illegible] the Harrington's solution and the absolute [illegible] use. The absolute alcohol employed is that [illegible] stage of the catgut preparation.

Before leaving his bed for the theatre [illegible] woollen stockings are put on the patient's lower limbs [illegible] up as far as the groin and keep him warm during and immediately after the operation.

Section IV

Upon receipt of instructions that the operation theatre is required the following routine is carried out.

(1) *The Theatre Attendant* at once (a) turns on the heating electric radiators, (b) lights the Primus stoves which heat the water sterilizers, (c) fills the electric sterilizer with water and switches on the heating current, (d) places a bottle of [illegible] saline solution in this sterilizer, (e) places all bowls and dishes to be used in the [illegible] tank. These take quite half an hour to fully attain the [illegible] hence the need of attending to them first of all. He also (f) gets out the anaesthetic gear, (g) wraps the spirit soap, turpentine and methylated spirit bottles (for hand sterilization) in gauze soaked in hydrarg. perchlor. 1 in 1,000 solution and (h) saturates the floor with the last-mentioned solution to effectually lay any dust.

(2) *The Theatre Sister* (a) makes all lotions, (b) prepares the tables (with carbolic towels) for the mops and for the surgical instruments, (c) gets out the supply of mops, and (d) gets out the dressings for the operation wound.

(3) *The Operation Assistant* gets out (a) the surgical instruments required, (b) the ligature and suture jars, (c) the india rubber gloves for the operation.

If time permits the contents of both water sterilizers are re-sterilized at each operation, the contents of the cylinder marked "cold" being afterwards allowed to cool down, the other one being kept hot.

The prepared lotions are stored in enamelled hot water jugs of twelve-pint capacity, a carbolic towel being placed over the top to prevent contamination of the contents.

The mop and instrument tables with high brass sides (previously described) are prepared by lining the "well" formed by the [illegible] of the table and its brass sides, with special large towels wrung out of a 1 in 20 solution of carbolic acid the ends of these towels are long enough to overlap to form the roof of the "well" and make a closed compartment These towels are prevented from sagging down into the contents of the table by the two sterilized brass cross rods

Just before the operation the Sister makes a rough calculation as to the probable number of each variety of mops that will be required These are antiseptically transferred from the storage jars to one of the empty sterilized large mop bowls The roof of the well is then immediately completed by drawing over the ends of the carbolic towels in order to prevent contamination of the mops

The inside of the top of the instrument table is lined in the same way with carbolic towels as the mop table

Upon a shelf near the mop table is a jar containing the spirit [illegible] gauze for dressing the operation wound also a large dressing box containing wool and various kinds of bandages for fixing the dressing The boxes with the sterile contents are kept in a stand made especially for the purpose The india rubber operation gloves are wrapped in a piece of linen with attached tapes for making a secure bundle The outside of each bundle is clearly marked with the name of one of the theatre staff, so that each one gets their own sized gloves They are sterilized with the surgical instruments if gloves are not so wrapped up they tend to be holed by either the instruments or through adhering to the sides of the sterilizer After sterilization they are immersed in a bowl containing hydrarg perchlor 1 in 10 000 solution Separate india rubber glove fingers are stored in a small bottle containing 1 in 20 carbolic acid, so that one of them can be drawn over the finger of a glove which was accidentally perforated during an operation

The operating staff for the theatre consists of —

(1) Operating surgeon
(2) Anæsthetist
(3) Theatre Sister
(4) Operating assistant (a First Class S B S)
(5) Instrument assistant (a First Class S B S)
(6) Theatre attendant (a S B A)

The Sister and operation assistant are associated with me in the men's operation surgical ward of the ship The instrument

[illegible] from another ward and does not come to the theatre until just prior to the operation; his real function at an operation is to prevent the contamination of the stock of ligatures. By means of constant drillings in my operation routine this staff work together admirably. Everyone in the theatre (operating staff or visitor) wears an overall gown, a cap and a mask as previously described (see figure C). These caps and masks are washed each time but are not sterilized. All the staff wear rubber boots. As valuable time can be wasted by the staff in getting ready for the operation, the routine is that the Sister and instrument assistant are the first to scrub up their hands and be dressed up; the former must get the mops counted with the theatre attendant, for he is too busy doing other things at a later stage; the latter must get his instruments sorted ready. The operation assistant is the last one to scrub up.

Above the washing basin is a small shelf for the three bottles containing the solutions to sterilize the hands, also a jar holding a nail-brush; the latter lies in a carbolic acid 1 in 20 solution. Each bottle is wrapped in lint soaked in hydrarg. perchlor. 1 in 1 000. This enables us to handle the bottles while sterilizing our hands without having an assistant standing by for this special purpose. The hands and forearms are sterilized by scrubbing them thoroughly with the nail brush, spirit soap and water. This is followed in succession by the application of turpentine and methylated spirits. After vigorously sluicing the hands and forearms in 1 in 1 000 solution of hydrarg. perchlor., the gloves are put on out of a 1 in 10 000 solution of the same antiseptic.

The contents of the sterile tins are handled by a pair of Cheatle's forceps, the beak half reclines in a jar containing carbolic acid 1 in 20 solution when the forceps are not in use. Each member of the operating staff is thus handed a battiste apron, a linen gown and a pair of armlet sleeves. The shortened sleeves of the linen gown are tucked into the upper wider end of the sleeve armlets; the latter are secured in position by means of a sterilized pair of steel hoop trouser bicycle clips (see figure C). To prevent possible contamination of the gloves no member of this staff is allowed to tie any tapes of apron or gown, nor to adjust the upper end of the sleeve armlets.

After the patient has been anæsthetized he is transferred from the preparation room to the operating room. Special care is taken that the carbolic towels covering the mop and instrument tables are never rolled to one side to expose the contents until the

theatre do [illegible] and all [illegible] transference of the patient [illegible].

The greater number of the surgical instruments [illegible] in 1 in 40 solution of carbolic acid [illegible] anti-corrosive fluid which effectually prevents [illegible] or other damage to the instruments. The scalpels [illegible] and instruments for handling and cutting the ligatures [illegible] in methylated spirits in the glass tray. The bowl on the instrument table holds hydrarg. perchlor. 1 in 1,000 solution for the instrument assistant's hands. The theatre attendant [illegible] the operation area, and if it is an abdominal case he erects a portable wire screen to effectually divide the anæsthetist's domain from the operation area. The two mop bowls are half filled with normal saline solution, temperature 105° F. The mops themselves are stored in 1 in 10,000 solution of hydrarg. perchlor., but with the copious dilution of the normal saline the amount of antiseptic present is quite infinitesimal. Two bowls, adjacent to one another, are necessary if an accurate count is to be obtained. The mops are now counted by the sister and the attendant, for they are jointly responsible; the latter has been taught to call out loudly the number of each mop in numerical succession, but not until the mop has been actually transferred to the second bowl by the Sister. Having counted every single mop in use, the number is recorded upon a slate placed in such a situation that all can see. If at a later stage more mops are required, the number of the fresh supply is added to that already on the slate. Just before a start is made with sewing up the wound, the sister and attendant jointly count the used and unused mops. I am then informed of the number required to make the count correct. Not until these are accounted for is the wound sewn up; at the conclusion of the operation a further count is made and the final result reported to me. No mop is ever cut during the course of an operation, for to do this would confuse the count; should a "strip" be used as drain (to be left in), the tape and ball are not cut off until the wound has been sewn up and not until the final and correct result of the mop count has been reported to me. Also on the mop table is an enamelled tray which holds one pair of Cheatle's forceps, two mop holders, one pair of scissors lying in carbolic acid 1 in 20 solution. These are for the Sister's use, if required, during the operation.

The surgical instruments to be used are already in the sterilizer and only require to be lifted out into their dishes on the instrument

table. All knives [illegible] are wrapped in lint [illegible] in order to protect the sharp edge from becoming blunted [illegible] with the other instruments. The lists of instruments for various operations are framed and hung up in the theatre. If at any time there was a question of a missing instrument during an operation they can then forthwith be checked off.

The sterile lengths of batiste sheeting are now placed around the operation area. The Harrington's solution and absolute alcohol are poured out just before they are required. Each solution is applied to the skin by a sterile dry swab. Then the patient is completely covered with sterile towels excepting for the actual operation area, around which they (the towels) are anchored to the skin by towel clips. A carbolic towel (wrung out of a 1 in 20 solution) covers a small area of the sterile towels; the instruments in use are laid on this *only*. The larger instruments are passed through hot saline solution just before use to rid them of the carbolic acid.

The attendant changes the hand lotions as required during the operation, also adds hot saline solution to the mop bowls from time to time to maintain their heat and to ensure that no cold mops are handed to the surgeon. I use hydrarg. perchlor. 1 in 1000 and 1 in 10 000 solutions in this order for my hands during an operation and always using the weaker solution before continuing with the operation. A spirit gauze dressing is placed next to the wound excepting in a case where the local circulation of the skin has been impaired; in this case I use the same gauze wrung out of saline solution. This dressing is covered with wool which has been impregnated with a small percentage of hydrarg. perchlor.

The subcutaneous infusion, when required, of saline solution for shock or loss of blood, is quickly performed, especially at the time of an operation when everything is ready. An [illegible] Higginson syringe with a hollow sharp-pointed curved needle fixed in at its outflow end is kept always ready in a glass jar. Its transference to the sterilizer is a matter of a moment; the saline solution is ready and to this I add an ampoule of pituitary extract to each of the two pints I usually inject in such cases.

The patient is transported to and from his bed on a canvas stretcher, with the margins of the long sides of same turned over and sewn to make a compartment to accommodate a detachable carrying pole on either side. An iron spreader at either end keeps the poles apart. The canvas stretcher is left under the

patient during the operation, the poles are removed when he has been deposited upon the operation table itself and they are replaced at the conclusion of the operation

After the operation the Sister packs the gowns, towels, and sleeve armlets into the sterilizing boxes, and sees that all dishes and trays are carbolized before being put away The attendant sends the linen to the laundry, scrubs the used instruments in soap and water and washes out the theatre

In the routine dressings of ward cases I always wear sterilized india-rubber gloves

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THE POSSIBLE RECURRENCE OF MEDITERRANEAN OR UNDULANT FEVER AND ITS TREATMENT BY SENSITIZED VACCINES

By Fleet-Surgeon P. W. BASSETT-SMITH, C.B., R.N.

THE presence of large forces, both naval and military, in the Mediterranean area, with the probability of this continuing for some time, makes it important to consider the possibility of the recurrence in an epidemic form of the disease now generally known as undulant fever; for though this fever has been practically eradicated from both Services for the last ten years, it nevertheless is still endemic amongst the native population in many ports and islands.

It may be interesting first to review shortly the past history of the disease which came into notoriety after the Crimean War, when we had, as now, large forces in the eastern portion of the Mediterranean. The accurate history of the disease commences in 1859, when MARSTON, in an Army Medical Report, described the fever, but from a study of the works of HIPPOCRATES there appears little doubt that the disease was present in Greece in his time. During the seventeenth, eighteenth, and early part of the nineteenth centuries, many fevers in the Mediterranean region were described, but these were rarely differentiated from one another. After the Crimean War a particular disease was recognized among the many men under treatment in the Malta hospitals, which was then distinguished from typhoid and malaria. This was called "Malta remittent fever." In 1886 Bruce discovered the causative organism and described its etiological characteristics. Hughes then, in his classical work, gave in detail the clinical and other features of the disease, stating that it had existed in Malta and Gibraltar at least since 1800. He introduced the term *undulant fever*, which is by far the best title, as it does not restrict the disease to any geographical area, indicates one of the most important clinical features, and can easily be written and spoken in any language. During the last century the disease was known to exist chiefly at Malta and Gibraltar, but cases were more or less common in Italy, Greece, Turkey, Asia Minor, Egypt, and most of the Mediterranean islands. It is important at present to note that known endemic centres are Salonika, Constantinople, Beyrout, Smyrna, Alexandria, Cairo

[illegible] Cyprus Candia and Malta One of the important [illegible] factors now recognized is that the disease is not [illegible] originally thought to the sea-ports, but that inland [illegible] verely, notably in Malta island itself and in Italy, [illegible] Corsica, Spain and Portugal the more the disease [illegible] the wider its distribution appears to be The [illegible] is the *Micrococcus melitensis* and its variety *M. para melitensis* which appear as minute cocci or cocco-bacilli these when introduced into the body give rise to an acute or chronic septicæmic condition The organism may gain access to the body by (1) food, particularly fresh goats' milk (2) by infection through the skin or mucous membranes all recent researches have emphasized the importance of recognizing this method in rural districts Wherever goats' milk is commonly used in Europe India Africa and America, the disease tends to become endemic though the infected goats themselves rarely show any marked evidence of disease even when the milk is heavily infected with the specific germ, and thus too often a continuous supply of the organism was given in the food to the young and to hospital patients This supply has now been cut off for the Services by prohibiting the use of goats' milk and partially to the civil population by the slow elimination of the infected goats and by boiling all milk It must be remembered that cows are occasionally infected and as shown by STRACHAN in South Africa this is due to the close proximity of goats and cows at night the infection being conveyed from the goat to the cow EYRE states that horses mules cows goats, and sheep may all become naturally infected The infection from man and animals chiefly escapes by urine fæces and milk, ambulant cases are not uncommon in endemic areas and are a source of infection There can be no doubt that the present conditions in the Mediterranean region are attended with special dangers The aggregation of large numbers of men who are of different nationalities and habits in small areas under conditions of trench warfare where sanitary measures are extremely difficult to carry out and where flies abound, associated with a high temperature will produce conditions of place which, together with a lowered resistance of the individual brought about by hardships and injuries, must if any ambulant case of infection is present favour the development of Mediterranean fever Not only is it thus not unlikely for cases to develop in the fighting line, but the concentration of the men and women in camps and hospitals as Cairo, Alexandria Lemnos, Cyprus, and Malta, which are endemic

centres, is attended with some danger. We must not forget that though ingestion of infected milk is the most common and potent cause of the fever, yet accumulated experience shows that it is not the only way, for the products of milk (cream, cheese, etc.) can carry the germ, and the organism is fairly resistant outside the body, so that infection by these and through the skin and mucous membranes are not infrequent and explain the occurrence of the disease in those who do not drink milk. We must therefore urge with all the persistence we can the utmost importance of not ignoring those safeguards which have in peace time been so effectual; happily these so far under the abnormal conditions have been sufficient. Last year in the Navy there were only six cases, and four of these were Maltese, but the *infection is not absent and is under control only as long as we recognize its presence and take the necessary preventive measures.* These are: The complete medical control of all milk supplies with absolute sterilization, avoidance of the local products of milk, and recognition that the stools and urine may be infective; also that disinfection and personal cleanliness are as important for the prevention of undulant fever as for typhoid. In every case of fever of irregular type the blood must be tested for the disease as a routine method, and not only fever cases, but any showing irregular symptoms with or without neuritis. Major Sinclair in South Africa has lately shown how common it is there to see cases apparently without fever who are really infected with the micrococcus, the temperature taken in the morning is normal or subnormal and the rise at night only slight. These intermittent types are well known to the older Naval Medical Officers, but we have now another generation who never saw, and perhaps hardly appreciate, what prolonged ill-health the infection once introduced may cause. For these officers I would particularly sound this warning note.

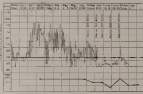
Vaccine Treatment

The first attempt to treat undulant fever with vaccine was carried out by Staff Surgeon Reid, who employed a stock vaccine in nine cases with encouraging results. A little later a systematic trial was made at Haslar by Bassett-Smith on sixty-one cases in all stages of the disease, using a stock vaccine prepared from a strain isolated from one of the cases, the amount of dosage being guided by the opsonic index, which was regularly taken for each case, the agglutination curve being also registered. There was generally a short negative phase, followed by a more or less high

positive one lasting a variable time in accordance with the dose and the condition of the patient

The initial dose was about 500 million organisms and the interval between the injections was ten days The conclusions arrived at were that the vaccine treatment appeared in a certain number of cases to produce a beneficial result, the severity of the symptoms being diminished, the general condition improved, and the duration of the disease curtailed but that in the more severe type of case with high fever and evidence of marked auto intoxication the method had a deleterious rather than a favourable action Experience has shown that the dosage was too large for acute cases

CHART 1



Undulant Fever Showing temperature and agglutination curves There was an [illegible] of the pyrexia after second dose of vaccine and a rapid recovery [illegible] showing quick reaction to vaccine

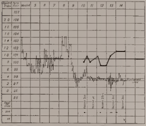
STRACHAN used vaccines in ten cases, and he states that his results were not inconsistent with those quoted above WRIGHT treated a chronic case with a vaccine and after four inoculations the temperature fell to normal

KENNEDY treated a chronic but severe case with an autogenous vaccine he commenced with a dose of 100 million but obtained better results with much smaller ones 6 to 10 million The temperature fell to normal with six inoculations after thirty days and there was no further rise ALLEN recommends 5 to 10 million in

acute cases and double this in chronic cases. It is a stock vaccine has to be used a polyvalent one would probably give better results than when using a single strain.

Recently the use of sensitized vaccines has been much advocated; these were introduced by BESREDKA, who brought them into general use. They consist of suspensions of killed bacteria

CHART 2



Thin line=Temperature curve Thick line=Opsonic curve
Dotted line=Agglutinin curve

Example showing quick reaction to vaccine

which have been sensitized by treatment with specific immune serum. The bacteria unite with the specific immune body present in the serum so that the combination is ready to unite at once with the complement of the patient's blood when the vaccine is injected; the disintegration of the bacteria commences at once and produces a more rapid immunity. When unsensitized vaccines are used after injection of the vaccine containing the antigen the tissues have to elaborate the specific amboceptor before the

complement [illegible] The im-munity conferred is established only [illegible] days, during which the resistance of the organisms [illegible] the injection is accompanied by some local and general [illegible] the negative phase. The immunity given by sensitized [illegible] is produced within twenty-four to forty-eight [illegible] the injection accompanied by [illegible] reaction [illegible] as there is no [illegible] of the [illegible] the sensitized bacteria at once [illegible] of the [illegible] and the rapid phagocyt[illegible] of their [illegible] that is the endotoxin is rapidly [illegible] which [illegible] the formation of antibodies [illegible]

A [illegible] *melitensis* vaccine has been prepared [illegible] by the following method for therapeutic use [illegible] of the disease. —

A [illegible] considerable virulence was used which had recently [illegible] through a guinea pig and [illegible] Agar cultures were [illegible] large [illegible] bottles which were allowed to grow at 37° C. [illegible] hours, the growth was then washed off with sterile [illegible] by heating at 58° C. for half an hour, and [illegible] inactivated highly immunized rabbit serum [illegible] the [illegible] It was then washed and centrifuged [illegible] the emulsion of sensitized micrococci was standard-[illegible] Wright's method, tested for sterility, diluted down so that [illegible] contained 50 million organisms, 0.5 phenol [illegible] the vaccine was then bottled off. The following [illegible] was carried out —

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Hæmolysis	Result
[illegible]	1		0.15	0.25	— — —	Complete fixation
[illegible]		1	0.15		+ + + —	Slight fixation
			0.15		— — —	
[illegible]	[illegible]	1	0.45		+	Almost complete fixation
[illegible]	[illegible]	1	0.1		— — —	Complete fixation
[illegible]	[illegible]	0	1.45		+ + + +	No fixation

[illegible] the sensitized vaccine absorbed the greater part [illegible] showing that it was almost completely sensi-[illegible] When [illegible] immune serum was added the absorption [illegible] complete therefore when used the vaccine should [illegible] immediately.

[illegible] test a rabbit was inoculated subcutaneously with

two doses 0 5 and 1 0 c c of the vaccine with a six day interval and after fourteen days the blood when tested gave a positive agglutination reaction up to $\frac{1}{20}$

M para-melitensis

The variations in agglutinability of different strains of *M melitensis* have long been recognized ZAMMIT and others have described a *M pseudo melitensis*, but NICOLLE was the first to demonstrate the specific differences of the two forms by means of the agglutination and absorption tests and by animal experiments The abnormal strain had been designated *M melitensis* B it had been originally isolated by BRUCE, and subcultures of it have been widely disseminated in the various continental laboratories NICOLLE found that the two strains which gave the same cultural reactions were quite different in agglutination tests A would agglutinate with ordinary Mediterranean fever serum to high dilutions 1 in 2 000 whereas B with the same serum would only all act at about 1 in 20 and vice versa In an animal immunized with A culture, its serum would give a high titre with A culture, but a low one with B culture By absorption methods the serum of an animal immunized with A could have all the agglutinins for A removed and still show low ones for B or the low agglutinins for B could be removed with B culture, leaving the high agglutinins for A The reaction I have found also to hold good in a human case of *para melitensis* infection which was contracted at Hyeres, the course of this case was very prolonged but finally recovered under action of *para melitensis* vaccines given in small doses It has been found that goats, especially those in Algeria brought from Spain, were frequently infected with the *para melitensis* strain or with both The use of these two strains for diagnostic work has been the cause of many of the contradictory serum reactions which have been reported

Though the cultural characters of the two varieties are almost identical one notices that on agar the growth is more dense and that morphologically the *para-melitensis* strain is much more definitely bacillary than the true *M melitensis*, and also it is much more easily agglutinated with non specific sera and is more auto agglutinable. Also with it immunization of rabbits is more difficult and the agglutination curve rarely runs so high whether the inoculations are made intravenously or intraperitoneally Examples of immunization are given showing the different reactions in each case

Example 1 —Rabbit, weight 3,850 grm.

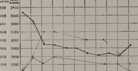
June 2 —Inoculated intravenously with 1 c c of a live emulsion of a twenty four hours' culture of *M para-melitensis*

June 23 —The microbe was recovered from its blood

The agglutination curves for *M para melitensis* and *M melitensis* with the variations in weight of the animal are shown on the chart Ten heated sera sent for Wassermann tests gave complete negative reactions with this strain at 1 in 40 and upwards.

Chart 2

Example 1 —Para-melitensis Infection



——— = Weight curve
——— = Para melitensis agglutination curve
- - = Melitensis agglutination curve

Example 2 —Rabbit, weight 3 300 grm

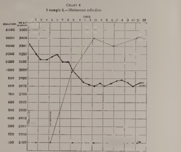
July 3 —Inoculated with 1 c c of living emulsion of a twenty-four hour culture of *M melitensis* which had recently been passed through a guinea-pig

July 5 —The microbe was isolated from the peripheral blood which agglutinated with the rabbit s serum in a dilution of 1 in 2,000 The animal was heavily infected, lost weight markedly and the titre for the *M melitensis* ran very high, but that for the *M para-melitensis* did not rise above 1 in 100 The animal was killed on the 25th, and the specific organism was recovered from the heart, blood and spleen On examination, the left testicle was

[illegible] large and [illegible]peared as a grumous mass, a condition of low [illegible] The strain of *M. melitensis* tested with [illegible] failed to agglutinate any at 1 in 40 dilutions

CHART 4

Example 2.—Melitensis infection



—— = Weight
—— = Melitensis agglutination curve
= Para melitensis agglutination curve

and above From these results the specific variation of the two strains seems to be distinctly demonstrated and shows the importance of having reliable cultures for diagnostic laboratory use

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THE VITAL IMPORTANCE OF EFFICIENT TRAINING OF NAVAL RATINGS IN FIRST AID

By Surgeon RODERICK J G PARNELL R N

In the *British Medical Journal* of November 21 1914, Sir W Watson Cheyne emphasized some important points in the treatment of wounds received in naval actions His experience showed that —

(1) In naval actions *all the wounds* he had at that time come across *were septic*

(2) The *immediate treatment* of wounds is of supreme importance, for early treatment is the only means of diminishing the likelihood of the occurrence of septic processes

Concerning the first point, our feelings can be only those of dismay, and it seems an urgent duty for us to consider whether this deplorable state of affairs can be remedied We must consider first of all the conditions under which we work in action Up to the present war, our plans from lack of actual experience had been based on a careful survey of the happenings in the wars which Japan waged against China and Russia Japan learnt by bitter experience the hopelessness of segregating the wounded the medical officers, their assistants and medical stores in exposed positions

We reaped the benefit of such mistakes that were made In 1903 the Durnford Committee laid down many excellent axioms, all of which are well known to naval medical officers Among them must be noted one which emphasizes that *nothing but first aid should be attempted during action* The medical staff with their assistants have to remain below at their stations as long as the ship is fighting, should a lull occur they may be permitted to come up, but their value after the action is so great that it is deemed inadvisable to expose them to danger while the action is in progress Thus at the start it becomes obvious that *the immediate treatment* of wounds will have to be carried out during action *by the men themselves*

Consequent on Sir Watson Cheyne's article the question very properly arises whether our men are properly trained to deal with the situation in a really efficient manner We in the medical profession know how weighty is the problem of dealing with wounds under such conditions Anything short of thorough

training such as we receive as students in hospital is inadequate to deal with wounds under the most favourable conditions, yet upon the shoulders of our men is placed the burden of dealing with severe wounds under conditions than which it is not easy to imagine worse! But it is not with flesh wounds only that they will have to deal. Immediate first aid measures will have to be undertaken by the men themselves to deal with burns, scalds, fractures, and the various degrees of hæmorrhage, all this while under fire and with other duties to attend to! How are they to get the necessary instruction, and acquire the knowledge which alone can fit them for their task? It is a very difficult question to answer—one about which I have often thought—one which is very worthy of our closest attention. It is the medical officer's duty to see that they are fitted for the task which has been allotted them.

As a rule it is considered that any of the numerous subjects which are included in the course of instruction of naval ratings are of far greater importance than a knowledge of first aid, whereas actual experience in the present war has shown that a thorough acquaintance with this subject is a vital necessity on the part of every man in the ship. Wounds can only be prevented from becoming septic by early efficient treatment, *and this can only be undertaken in action by the men themselves*. Life can be saved by the arrest of hæmorrhage and by the prevention of shock. Surely it is a duty we owe our country to save every life we can, to shorten the period of our man's ineffectiveness through wounds, and thus to increase the efficiency of our fighting force. What I plead for most earnestly is the adoption of the following measures which I will call "The ideal to be strived for."

(*a*) First aid to be a compulsory subject in the syllabus of instruction of all naval and marine ratings. The knowledge to be thorough and practical.

(*b*) All ratings to be examined by examiners who have given special study to the subject from a naval point of view. On passing it should be noted on the Service certificate. If a failure occurs it should debar from advancing to a higher rate, as would a failure in seamanship or gunnery.

(*c*) Each rating to become acquainted with the practical side of dressing and purifying wounds, etc., by attending for at least twelve occasions at the sick berth of ships and barracks or at the hospitals, where he should be given every opportunity of seeing all types of accidents and injuries. I have thought of bringing this

suggestion forward in a ship, but from opinions expressed I find that objections would probably come from the men themselves, who would not care for their messmates to be in constant attendance at the sick bay and thus do away with all privacy. This does not seem altogether unreasonable, though it could be obviated by limiting the cases for demonstration to injuries only.

I attach the greatest importance to the institution of practical instruction on actual cases. The men have got to deal with *real* fractures, *real* hæmorrhage and *real* wounds; they are instructed only on *imaginary* ones. Might we not as well instruct our gun layers entirely theoretically, put them in ships and expect them to work *real* guns (which they see for the first time) and yet to get good results? Really the parallel is not very much exaggerated and it makes one realize the present state of affairs. At present we have to be content to do our first aid instruction under bad conditions, for our only means of effecting it is by means of lectures. Before describing what has been done in the "Irresistible," I want to say a few words about lectures and class taking in general.

First-aid lectures, since we must have them, should be given regularly to not more than twelve of the ship's company at a time. I find it very difficult to instruct with success a larger number. Four classes are taken with each twelve men. The subjects considered are dealt with later. Suppose then there are 720 men in the ship—that means sixty lots of twelve each—calling for 240 lectures! One begins to realize that there is going to be some laborious work! Averaging two lectures a day it can be done in four to five months; this, of course, is working at high pressure, but in a commission during peace time every one ought to be instructed in the first year, quite easily, working with but one daily lecture on five days a week. Very few ships have such large complements, and in those with smaller numbers the work is proportionately slighter.

The duration of the class should never exceed one hour; one cannot lay down a fixed time for all occasions, for the simple reason that many circumstances are concerned in determining the duration of a particular class. Such circumstances include the state of mind or health (on which depends the success) of the lecturer himself. One morning he may be able to interest his class for more than an hour without noticing the passage of time; another morning his greatest efforts may prove a failure, of which he is only too conscious. Similar causes may exert their good or baneful

influence from the side of the class. It must be remembered that there is a certain amount of skill required to gain and hold the attention of a dozen young men whose minds are probably set either on some recent happening, or on some future event more pleasant than the arduous task before them (the dinner-hour perhaps!). Their attention is probably anywhere except on the matter before them and their mood may be morose ('fed up') or one of "ragging." The lecturer has to be quick to perceive the lie of the land, has to banish undesirable moods, gain the attention of his class and more important still, keep it. To do this requires experience and a knowledge of human nature. Sometimes it is accomplished by means of an anecdote or a reference to some topic of the day which can be made to work in the subject to be tackled. The principal is to make the class turn their thoughts at once on a given matter and keep it there until they are ready to be taken on to the other matter.

First aid lecturing to naval ratings is not at all easy to accomplish successfully. The medical officer who goes to his lectures unprepared is bound to meet with many failures; experience teaches one that failure is only too ready to appear, unless preparations are very thorough. The various classes differ entirely in intelligence, keenness and temperament; the same class may vary in all these ways on different occasions. The best way to learn is to be always at it, and soon it becomes a duty of very great interest.

The language one employs should be very simple, lucidity is the quality to be aimed at, and the lectures should be made as practical and interesting as possible; anecdotes bearing on the subjects should be collected and are most useful to spur a flagging interest.

Scheme of Instruction in H.M.S. "Irresistible."

The Senior Medical Officer handed over to me at my request the entire instruction, and gave me a free hand to do what I considered best, as far as was possible under existing conditions. He had already instructed a considerable proportion of the ship's company, but there was a large number of extra ratings, many of them Royal Naval Reserve and Royal Fleet Reserve men, who had never been instructed at all. My scheme was in principle as follows: Four lectures (not longer than one hour each) to every twelve men, until the whole ship's company had been instructed. Working by myself, this would have meant a good six months of work, for it entailed the giving of over 250 lectures. I allow for no lecture on Sundays and

one only on Saturdays Six months then before we could say that everyone was ready, and at any moment we might go into action! Hence it was necessary to draw up a subsidiary scheme, which took precedence of the original one This was —

(1) Instruction of all officers

(2) Instruction of all guns crews

(3) Instruction of the stretcher parties and men told off to assist at the dressing stations

(4) Instruction of a proportion of the engine room ratings

By the end of the year this was practically accomplished I was given every facility by the Commander and was greatly assisted by the Lieutenant (G.), who himself kept a record of each gun's crew's progress. The work was continued—circumstances governing its regularity or otherwise Despite the large number of lectures given the work, far from becoming monotonous carried with it an increasing interest—and the lecturer reaped the benefits of improved delivery and facility of self-expression which constant practice confers

The Four Lectures in Outline

Lecture I.—In order really to interest the men in first aid it is very important that the initial lecture should not bore them, but rather it should give them a relish for the three to come. Therefore I devote the first hour to a narration of the way in which first aid has come to be of such vital importance in the Navy I review the Chinese Japanese and Russo Japanese Wars, the horrors which occurred in the first as the result of segregating the wounded in exposed positions, of stores (drugs etc) being destroyed, and of loss of the medical staff through exposure in action the lessons we learnt from the Russo Japanese War, and the important findings of the Durnford Committee of 1903 I impress upon them most earnestly that *they themselves and they alone* will have to render first aid during the action, that it will be no use calling for the medical officers, they must learn to rely on themselves this they owe as a duty to themselves, their own relatives, their messmates and their country How are they to prepare for this? By careful attention at these lectures, in order to acquire all the knowledge they can I then look back on past experience and draw a picture of the probable conditions under which we shall be, and of the various injuries which will most likely occur This includes a consideration of all the circumstances which lead to burns and scalds (high explosive shells, burning paint and woodwork, bursting

of steam pipes etc.) to fractures wounds of a very severe nature, haemorrhage and shock, just touching on these with a few general remarks

Having thus made up our minds what we are to be prepared for, and again laying emphasis on the fact that it is of vital importance for them to learn all they can—since in action they have to help each other—I tackle the first subject, "Burns and scalds" We consider the causes, dangers and treatment on general lines Shock is mentioned—but I deal with this in greater detail later on, since I find it is not a suitable subject for a first lecture, being not easily understood by most classes The importance of covering up a burn at once is insisted upon—and the various ways in which this can be done are detailed, special instruction being given in the use of the picric acid dressing—I keep one of these dressings open for demonstration purposes This lecture is usually listened to with great interest and sometimes oversteps the hour by a few minutes

Lecture II on Fractures—First a demonstration on the human skeleton—using the diagram supplied Some interesting comparative anatomy points are used to gain the attention while only necessary elementary facts are stated in very simple language Fractures are defined, and the simple and compound varieties explained I teach them the signs which are present when a bone is broken, and give them an easy way of memorizing these Having learnt how to tell when a bone is broken I take them on to the first aid treatment Various fractures are imagined Bandages, splints etc., are applied to and by members of the class until proficiency is attained

Lecture III on Wounds—Experiences in the present war culled from medical papers, letters, etc are narrated, showing how immediate first aid treatment and purification of the wound prevent poisoning, and thus get the men back to the fighting quickly, and so increase our chance of victory Sir Watson Cheyne's sad experiences of naval cases are told them

Signs of poisoning—nature of poisonous germs—how to prevent their access to wounds and how to kill them or prevent them acting if once they have gained admission Necessity of strict cleanliness in dealing with wounds Antiseptics and their use

Lecture IV on Hæmorrhage and Shock—This I find the most difficult of the series, because of the impossibility of making clear in a few minutes the true nature of the vascular system it is all imaginary to them—one cannot show them real bleeding and its actual arrest First, then, I give them a rough outline of the heart

and vessels and their functions Stoppage of all kinds of bleeding by immediate pressure to the bleeding spot—is a maxim I ram well home again and again, similes and illustrations with water-tap are given Compression of vessels by the fingers and by tourniquets next occupies our attention All the principal vessels are compressed—and I do not rest content until each member of the class satisfies himself that the pulse below can be obliterated The signs of internal bleeding are pointed out, and this takes us on to the subject of shock—its recognition and the many means of combating it If time permits I quickly run through the salient points of all the subjects dealt with in the four lectures I call attention to the valuable Service Manual of First Aid which is supplied to the ship's library To this little book I am indebted for many useful hints

At general quarters the Lieutenant (G) arranges with me a number of supposed cases in various positions, to them labels are attached indicating the nature of their injuries Opportunities are thus offered not only for demonstrating the results of strict attention at classes, but of showing independent action in lowering them to the dressing stations It has been interesting to observe the gratifying improvement which has resulted—bad errors are now seldom seen When the cases arrive at the stations I give a short demonstration on them to those who are able to attend—pointing out good work as well as mistakes

I have had excellent opportunities of doing all I could under the present Service conditions and the results obtained convince me that with the adoption of "the ideal I have put forward we should be almost perfect in our preparations for all emergencies

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SOME OBSERVATIONS ON MENTAL CONDITIONS AS OBSERVED AMONGST THE SHIP'S COMPANY OF A BATTLESHIP IN WAR-TIME

By Temporary Surgeon THOMAS BEATON, M.D., R.N.
Late Assistant Medical Officer, L.C.C., Long Grove Asylum

It is always interesting to observe the psychological reaction of a large body of men when placed in exceptional circumstances, and in these times a few remarks as regards the mental conditions applying in my own ship may not be out of place.

Any mental state depends upon, or is the resultant of, two or three main factors: first, the type of mind, for the adage that "one man's food is another's poison" is no less true in matters psychological than it is in physical affairs; then the conditions or influences or stresses derived from the surroundings, the circumstances in which the mind is set to work; and finally, the degree and direction of the change in such external influences from what they were previously to what they are at the time under observation. It is as well to consider the material and the previous environment as a preliminary to investigating the reaction under the present conditions.

In this connexion it is found that, in this ship's company, by far the majority of the men are derived from the Royal Fleet Reserve. A considerable proportion are Royal Naval Reserve ratings, and a very few are actual active service men. Most of them are married, and in their shore life have held positions demanding considerable intelligence and necessitating much self-reliance. Some have had a certain amount of responsibility in civic life. It is evident, then, that this ship's company cannot be regarded as if they were a typical naval crew, and therefore their reaction will be different from that of such men when they fall into their new conditions.

From the purely mental standpoint many grades of intellectual development are to be seen, but, on the average, the type is quite high, and, compared with a similar body of men elsewhere, very satisfactory. In only one case that has come under observation has there been any question of actual mental deficiency.

The material, then, consists of a very good standard of man—men from the better part of the working population, who, by

reason of their responsibilities, have made the habit of taking forethought and of acting in accordance with their own considered judgments

Passing, then, to consider the nature of the new influences to which they are subjected, and the reactions which have occurred, it is advisable to divide the time since the beginning of the war as regards this ship into three periods corresponding to position and movement of the ship

First, a long period of over four months, during which the ship was lying in an exposed position on the East Coast second, a short period amounting to two days, while the ship was at sea and the third, another lengthy period of, so far, about six weeks, in the course of which the ship was lying in a protected harbour on the South Coast

Roughly speaking, the influence of the first period was in the nature of a prolonged and monotonous stress Owing to the nature of the position the routine demanded was of an extremely irksome type, consisting of continual watches, night and day, daily repetition of the measures for defence and offence possessed by the ship, and, save for a very occasional route march giving the men two or three hours away from the ship, nothing to break the monotony or give some little change to the environment

Recreation while off actual duty, too, presented many difficulties owing to the need for darkening the ship and the shortness of the daylight at the time of the year

There was the always-present possibility of attack by submarine or by ships of superior force, at some times more apparently imminent than at others

Apart from these special conditions appertaining to this ship there were many other considerations to be taken into account in dealing with men of this type and it will be best to follow an average man from the time of his joining the ship, in order that they may be fully appreciated

The man takes up his duties, it may be assumed, with more or less eagerness and pleasure, the unpleasant facts of leaving his home and his ordinary life and the possibility of danger in the new sphere, being more than counterbalanced by the emotional satisfaction arising out of the gratification of his patriotic instincts Largely influenced by this self satisfaction he smooths over his absence from his home the life on board ship obtains a certain glamour, and the little difficulties to be encountered do not appear on the horizon There is also the feeling of returning again to a life

belonging to his younger days, of which he undoubtedly recalls much that is inviting. He meets a large number of entirely fresh faces and, in the interest to be found in such circumstances, his mind is fully employed.

It was remarkable to notice how quickly the men settled down and merged their individuality into the component of the ship's company. Given a short space of time, the man has sorted out the new acquaintances into friends and otherwise, the novelty of the situation has passed off, the routine no longer demands that close attention which was necessary at first, and there is nothing further to be discussed in the ship. His mind then turns to other more remote matters—the possibilities of the duration of the war, the probabilities of the employment of the ship and the part he himself will actually play in the war. Such topics are naturally of great importance to him and, consequently, they were discussed everywhere in the ship. Pass along another week or so and these matters have been threshed out to the bone—everyone's opinion has been given many times over. The newspapers do not help by bringing any fresh material as food for discussion and he is completely in the dark as to any movement on the part of the ship herself.

It is only to be expected that, under such circumstances, discussion of these topics becomes unprofitable and highly unsatisfying. To a man accustomed to foresee his own course of action, it is very difficult to maintain a state of intelligent anticipation with so little material to work upon. More than that, the effort to maintain it in the face of such difficulties, coupled with the feeling of helplessness in his own destinies, becomes an irritating factor the longer it continues.

As a result it was found that, as a subject of general interest, the war and its personal application to the individual ceased to be heard. Instead, as a defensive measure, the man adopts a condition of more or less unstable apathy to his future, unstable on account of the setting on one side of his instincts of self-preservation and self control.

In the meantime he has been going on, day after day, repeating the same evolutions of the routine, and though, as regards the efficiency of the ship, the automaticity with which these come to be performed is very desirable, from the individual's standpoint the results are not so happy. Apart from the actual time while on duty, the man has nothing of importance in the ship left to think about. The effort, too, at maintaining a sufficient interest in so

monotonous and trying a routine becomes a steadily increasing stress as time goes on.

Consequently, as the man has been accustomed to think, and subject-matter for thought must be found, he turns to the relatively unimportant things of daily life as a relief. Now, any event, however insignificant, under these circumstances is liable to assume an importance entirely out of all reason when it occupies so relatively large an area of the destitute mental field. The imagination in dealing with such petty matters may easily become distorted, and whether the distortion will proceed in an exalted or depressed direction depends largely on the tone of the background on which the thoughts are spread.

It will be seen from the fact of the underlying stress and the failure of satisfaction of the primary instincts and habits of the man that the emotional background is more likely to be dark than bright. The disproportion will therefore probably exist in a direction tending to produce a state of anxiety and distress of the mind. It must be remembered that this anxiety, though outwardly attributable to the insignificant event, is in reality the outward expression of the general unsatisfaction of the mind.

The extent to which the lack of proportion will proceed now becomes a pure factor of the individual, and it is in those men where a morbid tendency already exists that the distortion will occur in the highest degree. There is no question of attributes such as courage and loyalty in the matter; given a well developed imagination and the faculty of viewing events in a critical spirit, the very fact of a man's zeal and his desire for action will help rather than retard the morbid process.

The attendance at the sick bay towards the end of the period under discussion showed quite plainly the necessity for taking these considerations into view in dealing with the various minor ailments and injuries which came under notice. Mild conditions of neurasthenia with hypochondriacal ideas were prevalent. Minor accidents all had a mental sequence of some kind. Most striking of all was the occurrence of a hitherto unsuspected case of general paralysis of the insane in an apparently healthy man who sustained a small injury to a finger, severing a tendon. The tendon was sutured and the wound healed perfectly, but during the period of convalescence the patient attracted observation, and it was found that he presented the Argyll-Robertson pupil, the markedly increased reflexes, etc., of the general paralytic. These, of course, probably did exist to some degree beforehand, but the interesting point was

the rapid advance of the disease dating from the trivial injury. In other cases conditions occurred which could only be described as of slight traumatic neurasthenia.

The second period of time, when the ship put out to sea, was productive of very striking effects. On the one hand, it came as a welcome relief from the terrible monotony of the first period, and the possibility that the ship might have been proceeding to take an active part instead of passively awaiting attack, might be relied upon to revive the patriotic emotions which had suffered from want of fuel. On the other, the risk to the individual was apparently much greater, and if the deterioration due to the first period had proceeded beyond a certain limit, then the additional acute stress might prove disastrous. Both of these suppositions were found to apply as a matter of fact.

By far the majority of the men showed appreciable relief—a general rising of spirits was to be noticed. Work was carried out with an eagerness belonging to the early days of the War, and altogether a sense of satisfaction could be felt throughout the ship.

In one case, however, a fatal result ensued, the man severing his carotid artery on the second morning at sea. In another severe emotional crises arose, attributed by the man to an alteration in his home affairs of which he had just heard. In others the intensity of hypochondriacal ideas in cases under observation became much greater.

What the effect of a prolonged period at sea would have been is extremely difficult to forecast; probably the two sides of the question would soon balance up again, the men would soon become accustomed to the new conditions, and would, no doubt, recover their usual tone.

However, there was no opportunity to judge of this. The second period was of very short duration and the third period of lying in a protected harbour commenced.

Here there is a very different picture; the men are not continually subjected to the stress of imminent danger, the exercises and manœuvres which they carry out are purely exercises and do not demand the strain of attention as they did formerly, and, of most importance, they can now have a little—very little, though under the circumstances—time on shore, away from the ship and its discipline.

In nearly every way this is beneficial; physically the cramping effect of life on board ship becomes relieved, and, more important still, the cramping mental effect also passes away in the intercourse

with new people. They meet new faces, can form new associations for themselves, and this expansion of the mind is of very great value.

Briefly to review the whole period it is seen that the psychological conditions consisted of a prolonged and monotonous stress, followed by a sudden increased stress and then by a quiescence as regards the present, the only worry existing in the future.

It may be said that so far the men have come through exceedingly well, mental troubles of a really serious nature having occurred in less than 1 per cent of the ship's company, while the mild neurasthenic conditions amounted to under 3 per cent or 4 per cent.

The conclusions to be drawn can only be that such lengthy periods as the first four months under the conditions which prevailed in the first part of the War are highly undesirable and should be prevented if military exigencies will permit. All the attention possible should be paid to the need of change in the mental environment while the men are under the influence of such continued stress, especially as adequate recreation could not be obtained owing to the military precautions necessary in such a situation.

That the results were not more regrettable can only be due to the standard of the men and their *moral*, and of that nothing too good can be said.

Editorial.

THE NAVAL MEDICAL COMPASSIONATE [illegible]

We drew attention, in our April number, to the [illegible] arrangements for increasing the scope of this Fund [illegible] popularity in the Service were nearing completion, that the [illegible] Parliament governing the Fund had been repealed, and that the revised rules only awaited the final approval provided by [illegible] in Council

We are glad to be able to state that the proposed Order in Council has now been approved

A glance at the appended rules will show that Medical [illegible] who now join the Fund will derive many great advantages [illegible] interest on the sum of £10,600 at present standing to the [illegible] of the Fund together with the amount accruing from [illegible] tions will be available for distribution amongst the widows and orphans of subscribers while in future the yearly subscription will be only 21s

Seldom does such an opportunity occur of making, at [illegible] cost some provision for wife and family in case of death, and it [illegible] anticipated that under such favourable conditions many Officers will now join the Fund The hope may be expressed that those who happily are possessed of means to provide adequately for the future of their families may also become subscribers and so help a very deserving cause

It is intended to admit subscribers under these new conditions *as from January 1, 1916 and Officers are now invited to notify the Hon Secretary Naval Medical Compassionate Fund Medical Department, Admiralty of their intention to join* In due course, however copies of the appended rules etc will be forwarded to all Medical Officers on the Active List

Since the year 1817 the title has been "The Naval Medical Supplemental Fund" but now the more correct designation is "The Naval Medical Compassionate Fund"

[illegible] and Regulations for the Constitution and Government of the Naval Medical Compassionate Fund

(1) The management of the Fund shall be vested in a President who shall also be a Trustee, two other Trustees, six Directors, an Honorary Treasurer and an Honorary Secretary. These or any three or more of [illegible] of the Directors mentioned in Article 3 hereof shall constitute a Court of Directors.

(2) The person holding the office, for the time being, of Medical Director General of the Navy shall be the President and a Trustee of the Society. The persons holding the offices for the time being of the Secretary of the Admiralty, and of Director of Greenwich Hospital, respectively shall be Trustees of the Society.

(3) Notwithstanding the provisions of Article 1, the existing Directors of the Fund may continue to act as, and be Members of the Court of Directors until their death or voluntary resignation, and may attend and vote at any Meeting of the Court of Directors.

(4) The Court of Directors shall co-opt from amongst the subscribers to the Fund not more than three persons as Directors who shall hold that office until three months after the termination of the present hostilities and in the event of any vacancy amongst these three Directors, or of the total number of Directors becoming less than six before that date shall similarly fill the vacancy by co-optation from amongst the subscribers to the Fund. Thereafter the members of the Fund shall annually elect from among their numbers six Directors at a meeting to be held for that purpose in London at a time and place to be fixed by the Court of Directors and announced by advertisement in the medical papers.

(5) The Fund consists of the sum of £10,600 2½ per cent Consolidated Stock now standing at the Bank of England in the names of William Harris Lloyd, Walter Reid, and Theodore Julian Preston, of whom the aforesaid Theodore Julian Preston is now deceased which shall be vested in the Trustees provided for in clause 2 without conveyance or assignment and of any further sum or sums that may have been or may hereafter be, donated to the Fund and which shall be invested in the names of the Trustees in such trust stocks or investments as the Court of Directors may approve.

(6) The interest on the above sums and the annual subscriptions hereinafter provided for shall be distributed by the Court of Directors among the eligible applicants for assistance at meetings to be held in the months of January, April, July and October in each year. Provided always that the necessitous orphans of deceased and present members of the Fund shall have the first claim to assistance from the proceeds of the interest on the sum now invested as described in clause 5.

(7) Medical officers on the Active List of the Royal Navy may [illegible] become Subscribers to the Fund, but officers who have subscribed to the Fund while on the Active List may continue as subscribers after [illegible] placed on the Retired or Reserved Lists or after resignation of commission.

The subscription shall [illegible] payable annually [illegible] to the Honorary [illegible] [illegible].

The following [illegible] of the [illegible] shall be [illegible] [illegible]:—

The orphans and widows of all [illegible] of the [illegible] of this Order [illegible].

The orphans and widows [illegible] [illegible] subscribers to the [illegible] provided that [illegible] [illegible].

The Honorary Treasurer shall [illegible] of Deputy Director General of the Medical Department of the Navy.

The Honorary Secretary shall [illegible] being [illegible] Honorary Secretary of the Royal Navy Medical Club. [illegible] [illegible] [illegible]

The [illegible] [illegible]

Historical.

SIR WILLIAM BEATTY, M.D., F.R.S., SURGEON TO H.M.S. "VICTORY" AT THE BATTLE OF TRAFALGAR.

By S. D. CLIPPINGDALE, M.D., F.R.C.S.

"He had served his country faithfully and in all [illegible]. It may be [illegible] that his whole professional life was in one [illegible] with [illegible] Nelson's last and ever memorable [illegible]."

Such was the opinion of Sir William Beatty, expressed at the time [illegible] by the *Gentleman's Magazine*, and it is probable that no [illegible] uttered by that classic periodical has been better deserved. [illegible] the following memoir, the writer has to express his [illegible] thanks to Dr. H. R. Popham Baker, of Blackheath, who has [illegible] the accompanying portrait and the following pedigree; to Mr. [illegible] Baker, of Rolvenden, Kent, who photographed the original [illegible] the pedigree; and to Mrs. Charlotte Frances Baker, [illegible] F. W. Baker, who kindly allowed both portrait and [illegible] to be used for this purpose.

PEDIGREE AND FAMILY HISTORY.

[illegible] Beatty, of H.M. Customs, Londonderry, m. Ann Smyth, [illegible] of Walter Smyth (who d. April 5, 1820) and sister also of Dr. [illegible] They had issue:—

(1) [illegible] Beatty, M.D. [illegible] and intestin [illegible] to William IV and to the Greenwich Hospital. Surgeon to [illegible] at Trafalgar. Knighted May 25, 1831. Wrote the [illegible]

(2) [illegible] Captain. Adjutant to the 24th and 25th Light Dragoons [illegible] Dragoons. Served in Lord Lake's campaign in the [illegible] Invalided from the Service, in October 25, 1812 [illegible] but left no issue.

(3) [illegible] R.M. [illegible] Was specially appointed to command the Marines in H.M.S. "Northumberland" (Admiral Sir George Cockburn), [illegible] took Napoleon to St. Helena in 1815.

(4) [illegible] of Bishop's Square, Londonderry, b. 1781, d. November 7, 1845 [illegible] Obituary notice in *Londonderry Journal* of that date.

(5) [illegible] 1782 [illegible] m. July 11, 1805, John Popham Baker, Commander R.N. (b. June 24, 1784, d. April 26, 1843) [illegible] Aaron Markham Baker, D.C.L. Wadham and All Souls Coll. [illegible] of Marksbury, Rector of Burnal and [illegible] Prebendary of Wells, J.P., D.L. for co. Somerset. [illegible] only son, the Rev. Frederick Walter Baker, M.A. Cai. Coll. Camb.

[illegible]

[illegible]

(2) *Jane* [illegible] 1809, m [illegible] 1 180[illegible] [illegible] cousin, Robert B[illegible] [illegible] September 4 1821, Rector of [illegible], Longford and Archdeacon of [illegible] (his mother died July [illegible]). They had sole issue —

Eliza m October 11 1831 William Carlisle Henderson of [illegible] barrister at law

II *Mrs Beatty* [illegible] to James Beatty of H M [illegible] died aged 40 leaving issue —

Captain Vincent Beatty

Mr Smyth of C[illegible] D[illegible]

Note —Lieut [illegible] December 8 1842 left Anne Baker the portrait of her brother Sir W [illegible]

There is little to add to the above pedigree Neither it nor any of the published biographies of Sir William Beatty give the date of his birth An examination [illegible] certificate, however shows that he was 69 at the time of his death in 1842, so that the year of his birth would be 1773

The Beatty family [illegible] the greatest antiquity Mr John O Hart, in his *Irish Pedigrees* writes "Geoffry, one of the Princes of Scotland who [illegible] the Irish monarch Brian Boru fought at the battle of Clontarf [illegible] was the ancestor of Betagh modernized Beattie and Beatty Mr O Hart further states that the family name is derived from the Irish [illegible] (bee a ta) a public victualler or keeper of the hostel attached to a monastery In this statement Mr O Hart is supported by the Rev Henry Barber M D F S A in his work on *British Family Names*

Sir William Beatty [illegible] Education and Medical Training

Nothing seems to be known as to where Beatty received his general education He probably received it locally That he was well educated we know from his writings Nor is any information forthcoming as to where he received his medical training He probably received it by that good old style—apprenticeship Yet he must have somewhere gone through a course of dissection for his knowledge of anatomy as is shown in his description of the course taken by the bullet which killed Lord Nelson is admirable

Sir William Beatty was not a member of the Royal College of Surgeons which was founded in the year 1800 nor of the body which preceded it the old Corporation of Surgeons He did not in fact receive any qualification as we should call it in these days until he had practically finished his active career He became M D of the University of St Andrews October 11 1817 and on December 22, of the same year became a Licentiate of the Royal College of Physicians of London For this latter diploma he passed the usual three examinations, his examiners being Sir Christopher Pegge, Regius Professor of Physic, Oxford, Dr Thomas Turner Dr John Ayrton Paris and Dr John Noble Johnson [1]

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[1] Information kindly supplied by Mr W [illegible] Fleming Secretary of the College.

Naval Career

[illegible] probably served an apprenticeship to [illegible] profession [illegible] Mate, but unfortunately no [illegible] this has [illegible].

He [illegible] commission December [illegible] 1793 [illegible] appointed Surgeon [illegible] Flying Fish. On March [illegible] transferred [illegible] Alligator [illegible] on September [illegible] the [illegible] March 26 1796 to the [illegible]. [illegible] his service [illegible] last-named vessel Dr [illegible] wrote which he found [illegible] John Popham Baker. [illegible] at the commencement of the French War [illegible] the [illegible] in which ship [illegible] independence [illegible] liberal and [illegible]. He remained on [illegible] until May 21 1797 when [illegible] to the [illegible] and on July 3 1801 [illegible] transferred [illegible] the Spencer [illegible] to which he remained until transferred to the Victory.

His appointment [illegible] the 'Victory' took place December 11 1803 and according [illegible] in Sir Nichol Harris's work was made by the Admiral (Lord Nelson) himself who had given the previous surgeon Mr George Magrath the Surgeoncy of the Naval Hospital [illegible].

On board the 'Victory' Beatty had as assistants Surgeons Smith and Westemburg [illegible] the evening of the battle of Trafalgar October 21 1805 he was joined by Surgeon Button of H.M.S. 'Pickle' who came on board to assist in the heavy casualty work. Mr Button returned to his own ship three days later namely October 24.

Casualties on Board the 'Victory'

These are all carefully recorded by Beatty in his Journal. The nomenclature and phraseology of this Journal are very similar to those used at the present time and the description given by Beatty of his cases shows that he had a good practical knowledge of anatomy pathology and surgery.

Beatty divides his Journal into two parts the first part dealing with the casualties which occurred prior to the Battle of Trafalgar and subsequent to his appointment as Surgeon in December of the previous year; the second part dealing with those casualties which were received during or following the Battle of Trafalgar and until the vessel was put out of commission at the end of the year 1806.

Each part of the Journal is followed by a 'Summary.' In the summary of the pre-Trafalgar period Beatty states that the casualties amounted to only five deaths and two hospital cases. Of the fatal

[illegible] Record [illegible] MS volume in the Public Record Office.

[illegible] of the Journal [illegible] known that at the time Beatty was [illegible]

Sir Nichol Harris [illegible] and Despatches of Lord Nelson.

Surgeon [illegible] Journal [illegible] MS volume in the Public Record Office.

Beatty [illegible] Journal [illegible] MS volume in the Public Record Office.

cases, one died of fever, three of consumption and one from injury to the spine. The hospital cases were consumption and were sent to Gibraltar Hospital. In the summary of the *post*-Trafalgar period, Beatty states that as a result of the Trafalgar action there were, in all, 102 casualties. There were five deaths on board and one at the Naval Hospital, Gibraltar. "All the others got well on board, except five of the worst cases who were left behind at Gibraltar, and five others who were not well of their wounds when the vessel was put out of commission at Chatham and were transferred to the hospital ship 'Sussex' lying off Sheerness."

The five fatal cases on board the 'Victory' were as follows:—

(1) "Midshipman Alexander Palmer was shot in the right thigh by a musquet ball. Bone and large vessels untouched. Died October 28 (... seven days after injury) from tetanus. Cold affusion and large doses of digitalis and opium were tried in this case."

(2) Henry Cranswell, seaman. "Simple fracture of the tibia and fibula with several severely contused wounds on different parts of the body. Died on October 26 of gangrene."

(3) Joseph Gordon, seaman. "Amputation of thigh. Died of sudden spasm, October 27."

(4) William Brown, seaman. "Grape shot through the inferior part of the left cavity of the thorax. Died October 23, of internal hæmorrhage."

(5) Richard Jewell, seaman. "Amputation of the thigh through the trochanter. He had lost a great deal of blood before he was brought to the cock pit. Died October 22. This man died shortly after the operation from the great violence he had received and from the removal of so great a part of his body."

Beatty's Journal is silent with regard to his chief casualty, namely the wound and the death of his great Admiral, Lord Nelson. His report upon this case was contained in a special document which is embodied in Beatty's well known monograph, the "Authentic Narrative."[1] Concerning this narrative it seems right to point out that it appears to be relied upon as the most authentic account of the Battle of Trafalgar. Most historians refer to it and Sir Nicholas Harris in his voluminous work makes thirty nine references to it and quotes whole paragraphs *verbatim*.[2]

Lord Nelson's Death

On the morning of the day on which the battle of Trafalgar was fought (Tuesday, October 21, 1805), Lord Nelson was in excellent spirits, for he felt that before the day closed a decisive victory would

[1] "Authentic Narrative of the death of Lord Nelson, with the circumstances preceding, attending and subsequent to that event; the Professional Report of His Lordship's wound and several interesting anecdotes. By William Beatty, M.D., Surgeon to the 'Victory' in the Battle of Trafalgar and now Physician to the Fleet under the command of the Earl of St. Vincent, K.B., &c., &c." London 1807. (Twice republished.)

Sir William Beatty was not the first military surgeon to record a medical events of national importance. To John of Ardern, Surgeon to the Black Prince, and present with the Prince at the Battle of Crecy, we owe entirely the story of the Prince of Wales's plume and the blind King of Bohemia.

[2] Sir Nicholas Harris, G.C.H.G. "Letters and Despatches of Vice Admiral Lord Viscount Nelson," 7 vols., 1845.

most probably recur to the fleet under his command He had said the night before to a group of midshipmen "Young men to-morrow will be a fortunate day for you" In this state of elation therefore, it is not surprising to learn that he insisted on donning prior to the battle full naval uniform excepting only his sword which he is supposed to have forgotten for it was found afterwards lying upon his cabin table Upon his left breast he fastened the four decorations to which he was entitled, namely, those of the Orders of the Bath St Ferdinand The Crescent, and St Joachim Of these he valued most highly the Star of the Bath and this he placed nearest his heart His chaplain and his secretary remonstrated with him for his boldness pointing out that he was simply providing an admirable target for the enemy's fire and suggesting that he should at least cover his decorations with a handkerchief but he refused saying "In honour I have gained them and in honour I will die with them" His determination to appear in battle so attired occasioned great consternation to the other officers but none dared to approach him again on the subject except his Surgeon, Mr Beatty (who felt that he was sufficiently familiar with the Admiral to do so) and who intended to do so, but unfortunately no opportunity presented itself, for the battle was soon in full swing

The opposing ships were in close contiguity in fact it was almost possible to leap from one to another The enemy ship that lay alongside the "Victory" was the "Redoutable," and upon the mizzen top of this vessel were posted two seamen who were furnished with short fire arms of some sort, either pistols or muskets Lord Nelson was on the quarter deck of the "Victory" talking to his Captain Sir Charles Hardy one of the men in the mizzen top of the "Redoutable" recognizing Lord Nelson by his costume took steady and fatal aim, the distance it is computed being not greater than 15 yards, and the bullet entered just below the left epaulette The men were immediately "sniped" by an officer on Nelson's ship one fell dead from the mizzen top the other was shot while escaping down the rigging

The course taken by the bullet after entering the Admiral's body is best described in Beatty's own words "The ball struck the forepart of his Lordship's epaulette, and entered the left shoulder immediately below the processus acromion scapulæ which it slightly fractured It then descended obliquely into the thorax, fracturing the second and third ribs and, after penetrating the left lobe of the lungs and dividing in its passage a large branch of the pulmonary artery, it entered the left side of the spine between the sixth and seventh dorsal vertebræ fractured the left transverse process of the sixth dorsal vertebra, wounded the medulla spinalis, and fracturing the right transverse process of the seventh vertebra, made its way from the right side of the spine directing its course through the muscles of the back and lodged therein about two inches below the inferior angle of the right scapula On removing the ball a portion of the gold lace and pad of the epaulette together with a small piece of his Lordship's coat was found firmly attached to it (see sketch)"

[1] It is obvious that the greater part of the hæmorrhage took place within the thorax Lord Nelson had already received upon his coat much blood from the wounds of his Secretary Mr Scott, who when shot was standing close to him On being taken

Before being carri[illegible] that a handkerch[illegible] might be put over his [illegible] the [illegible] means for hiding his [illegible] visage from [illegible] which he had declined to use for hiding his decorations [illegible]

On being exam[illegible] Lord Nelson said "Ah Mr Beatty you can do nothing [illegible] been shot through the spine [illegible] know the symptom[illegible] and had them explained [illegible] by Beatty in the[illegible] perhaps the case mentioned in [illegible] first [illegible] but [illegible] similarly injured [illegible] result of [illegible] Lord Nelson [illegible] completely anaesthetic [illegible] certain point [illegible] nowadays in the case [illegible] position [illegible] was of course practically [illegible] the position of [illegible] definitely and if it had [illegible] would [illegible] successfully or [illegible] The [illegible] great thirst [illegible] the [illegible] into his chest with [illegible] borne with [illegible] long wounded

[illegible] Lord Nelson [illegible] from Mr [illegible] drawing [illegible] Sir William [illegible]

[illegible] of clothing

The [illegible]

When he felt [illegible] approaching Lord Nelson had said to his captain "Don't [illegible] thrown overboard Hardy" If the people [illegible] to bury [illegible] let me have my body taken to my father's [illegible] at Burnham Thorpe [illegible] In compliance with his lordship's wish [illegible] it became [illegible] to do something to preserve [illegible] There [illegible] on board and it is doubtful [illegible] understood [illegible] The one thing possible was to preserve the body in spirit [illegible] coffin would of course be useless for the [illegible] would percolate through and there was no lead on board from which [illegible] could be made Procuring, therefore the largest cask on board, [illegible] called a [illegible] Beatty had this filled with brandy and into

[illegible] upon the ground and on it was placed Midshipman [illegible] who was bleeding seriously So that it is extremely [illegible] upon the coat shown [illegible] at Greenwich are [illegible] gallant Admiral's own blood

[illegible] had a prejudice against being buried in Westminster Abbey because [illegible] that it was built upon a marsh (which is true) and might some day be [illegible] (which is improbable)

[illegible] the Admiral's [illegible] [illegible] had [illegible] [illegible]

[illegible] the [illegible] Victory [illegible] taken to Gibraltar. When she [illegible] [illegible] departure to [illegible] experienced [illegible] had weather [illegible] below she [illegible] the English Channel [illegible] [illegible] the body was twice [illegible]

On [illegible] at Spithead Beatty [illegible] the body and [illegible] from the cask [illegible] the opinion that the intestines [illegible] He, therefore, decided to open the [illegible] He took [illegible] of [illegible] Nelson [illegible] a most [illegible] neither [illegible] It [illegible] Beatty found all [illegible] took this opportunity [illegible] the [illegible] described with [illegible] official report.

Beatty of course retained the ballet and the subsequent [illegible] of this missile will be found in a notice in "Notes and [illegible]" December, 1892, to which the writer's attention has been [illegible] by Dr. Fog[illegible] [illegible]. From this account it would appear [illegible] presented the bullet to Captain Hardy, who had it mounted in crystal and silver and returned it to the surgeon, and he for a time wore it as a pendant. It then passed into the possession of the Rev. [illegible] W. Bak[illegible], Rector of B[illegible], Hants, Sir William Beatty's nephew. Subsequently the family, through Lord Haddington, First Lord of the Admiralty, presented it to Queen Victoria, who had it placed in the Armoury, Windsor Castle, where it may now be seen.

It might be supposed that Lord Nelson's body would have been landed at some port on the South Coast. This, however, was not done, but a leaden coffin was sent on board into which the body was placed, outside which was a wooden coffin made from "l'Orient," the ship of the French Commander-in-Chief at Trafalgar.

The "Victory" sailed up the Channel round the Forelands and up the Thames, where it was met by Commissioner Grey's yacht, which conveyed the Admiral's body to Greenwich, where it lay in state for three days prior to being buried in St. Paul's Cathedral.

It is beyond question that Beatty followed the body of this great patient to its final resting place. *The Times*, however, in describing the funeral *cortège*, simply has this line:—

"Physicians in a Mourning Coach."

Sir William Beatty's Career subsequent to Trafalgar

It is much to be regretted that so little seems to be known of our surgeon's career after his return to this country in 1805, and before his appointment as physician to Greenwich Hospital in 1822. Fleet Surgeon W. L. Martin, one of the editors of this Journal, with the assistance of the Admiralty Librarian, has laboriously and most kindly searched the official archives without result, and the writer has examined the *London*

Gazette and the *Times* newspaper for the same period without success. It is probable that Beatty, having brought his Admiral's body safely home, was not required to go to sea again, but received some land appointment. That he was soon promoted to be Physician to the Fleet we know from the title page of his work ("Authentic Narrative"), on which he so describes himself and which was published in 1807. Dr. Munk[1] says Beatty was appointed Resident Physician to Greenwich Hospital in 1806, but the records of that hospital show that he was not appointed until September 7, 1822, and that he held that appointment until 1839, when he was superannuated.[2]

On April 30, 1818, he was elected a Fellow of the Royal Society;[3] on July 25, 1831, he was knighted by King William IV at St. James's Palace.[4]

LAST YEARS, DEATH, BURIAL, &c.

On leaving Greenwich Hospital in 1840 he went to reside at 43, York Street, Portman Square, and here he died March 25, 1842, the cause of his death being acute bronchitis.[5]

He is buried in Kensal Green Cemetery, but there is no stone over his grave, a regrettable incident to which the writer has already called attention,[6] nor can his place of sepulture now be identified.

He died unmarried and intestate, letters for the administration of his property, which was valued at £3,000, being granted to his brother Vincent Beatty (as next of kin), who was, at that time, Colonel Commandant of Marines at Plymouth.

Obituary notices of a highly laudable character appeared in the ensuing numbers of Dodsley's *Annual Register* and the *Gentleman's Magazine*, but the *Times* not only published no obituary notice, but did not even contain the usual paid-for advertisement.

[1] Munk, William, M.D., F.S.A.: Roll of the Royal College of Physicians, vol. iii.

[2] Information kindly supplied by Mr. C. H. B. [illegible], C.B., Director of [illegible] Hospital.

[3] The Royal Society at that time was not what it is now, a body of purely scientific [illegible], but [illegible] sort of social club, to which all gentlemen of distinction were [illegible].

[4] Shaw: Knights of England.

[5] Death certificate, which also states that Sir William's housekeeper at York Street [illegible] Mrs. Jane Jones, who gave information of the death. The name of the [illegible] attendance is not stated.

[6] Spinglole[?], S. D.: *Brit. Med. Journ.*, February 27, 1915.

Clinical and Practical Notes.

SOME SURGICAL CASES AT THE ROYAL NAVAL HOSPITAL, PLYMOUTH.

By Temporary Surgeon General RAYMOND JOHNSON, F.R.C.S., R.N., and
Deputy Surgeon General GEORGE A. DREAPER, R.N.

The following cases, although not illustrative of war surgery, seem to us to be deserving of record:—

Traumatic Intraperitoneal Hæmorrhage.

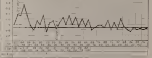
F. R., a marine, aged 19, ran down a steep hill on April 10, and being unable to stop himself came violently into a wall at the bottom. In putting out both hands against the wall his flexed elbows were driven against his abdomen. He was "winded," and after lying on the ground for half an hour was carried home. The same evening he was admitted to the Royal Marine Infirmary, where pain in the right shoulder was the chief symptom which attracted notice.

On the following day (April 11) there was some abdominal pain, but nothing suggestive of serious injury. On the morning of April 12, however, the patient's condition was worse, and at noon he was sent to the Royal Naval Hospital. On admission, the face was flushed and alæ nasi working; tongue furred and tending to dry; temperature 99° F.; pulse 104, respiration 48. There was slight general abdominal distension; muscular rigidity and tenderness were also general; the fulness and tenderness appeared to be slightly more marked in the right lower segment than elsewhere; there was no cutaneous hyperæsthesia; the liver dulness was normal and there was no dulness in the flanks. There had been no vomiting, and the bowels had acted shortly before admission.

The question which first presented itself was whether the case was one of peritonitis or of some pulmonary affection, perhaps pneumonia. The patient's appearance, the pulse-respiration ratio, and the absence of vomiting suggested the latter, but the temperature of 99·1 was much more compatible with some form of peritonitis.

Careful examination of the lungs proved negative, and operation was advised on the ground that peritonitis was present. It seemed, indeed, quite possible, in spite of the history, that the case was one of appendicitis, and it was borne in mind that occasionally a traumatism appears to be a determining factor in the onset of an attack. A small muscle-splitting incision was therefore made in the right iliac region, and on opening the peritoneum dark fluid blood escaped in considerable quantity. There was no peritonitis and the appendix was normal. A free median incision was then made and large quantities of blood evacuated, more from the right side than the left. No clots were present, and a thorough investigation failed to show the source of the bleeding. Saline solution was therefore introduced and the abdomen closed. With the exception of a troublesome cough and very profuse sweating during the first few days after the operation, the patient's convalescence was uninterrupted. The temperature, &c., are shown in the chart.

The [illegible] in the symptoms [illegible] produced by [illegible] intraperitoneal hæmorrhage, [illegible]. Although the amount [illegible] that none of the signs, [illegible]. It [illegible] also be noted that although [illegible] one of diffusing peritonitis there was a complete absence of [illegible], whilst the normal action of the bowels was [illegible] hardly to be expected if the intestines had been paralysed by [illegible] infection. The source of the bleeding is merely a matter for [illegible] possible [illegible] was a small rupture on the posterior part of the liver which could not be thoroughly explored.



Bullet Wound of Intestine: Enterectomy

On [illegible] 25 at 3.30 p.m. A. F., aged 33, was cleaning a Webley [illegible] revolver, and [illegible] who was standing about 4 ft. in front and to the left of him, was doing the same. [illegible] revolver, which proved to be [illegible] was accidentally discharged, the bullet striking A. F. above the [illegible]. He felt a sensation "as if something hot was going through [illegible] and a pain shot down his right leg." He went down on his [illegible] but was able to get up and walk to the sick bay.

On admission to the Royal Naval Hospital at [illegible] p.m. the patient's general condition was good; pulse 74; abdomen soft and not distended, [illegible] only present at seat of entry of bullet in the left pubic region [illegible] above the inner third of Poupart's ligament. A catheter was passed [illegible] withdrawn. Screen examination showed the bullet to be lying in the region of the right hip-joint. It thus appeared almost certain that the bullet had traversed the abdominal cavity, and at 7.30 p.m. it was noted that there was slight rigidity of the lower part of the abdominal cavity and a slight increase in the pulse rate. Operation was therefore performed, and on opening the abdomen below the umbilicus a little blood escaped. The intestine was examined and two round openings close together found in the ileum, the edges of the openings being formed by the everted mucous membrane. The damaged portion of intestine was excised, the ends closed by a double row of sutures, and

[illegible] by a lateral anastomosis. A small peritoneal [illegible] of the [illegible] part of the bowel was over-stitched and a small torn [illegible] ligatured and removed. The suture material was [illegible]. The track of the bullet in the abdominal wall was [illegible] with pure carbolic acid and the incision sutured in [illegible]. [illegible] trouble after the operation was a considerable amount [illegible] distension which was relieved after an action of the bowels following [illegible] of calomel given on the fifth day. There was some superficial suppuration in the incision on the sixth day and several buried thread sutures were subsequently removed.

The retention of the bullet caused at first a considerable amount of pain in the right hip, and a stereoscopic radiogram taken by Surgeon S. Bradbury on February 20 showed that the bullet was lying in the hip joint between the upper surface of the head of the femur and the acetabulum. As it seemed obvious that its removal could only be effected by a severe operation, involving a temporary dislocation of the joint, this was not thought advisable, and when the patient was discharged on April 13 the power of locomotion was steadily improving. A month later there was very little lameness and the patient could stoop until the hip was flexed to a right angle.

Calculous Hydronephrosis simulating Rupture of the Kidney

F. C., aged 17, boy, H.M.S. "Neptune," was boxing on April 7. Ten minutes after stopping he complained of severe pain in the left loin and vomited. When seen in the sick bay at 4 p.m., the temperature was 99.4° and pulse 84; there was tenderness with muscular rigidity in the left lumbar region; a short time previously a few ounces of bloody urine had been passed.

After admission to the hospital ship "Garth Castle" the amount of urine was normal, but blood was present for six days. A considerable elastic swelling in the left loin, regarded as a hæmatoma, gradually diminished in size and the temperature, which at first was elevated, fell to normal. Pain at first was so severe as to necessitate repeated doses of morphia.

On admission to the Royal Naval Hospital, Plymouth, on April 2[illegible], the boy's general condition was normal; there was distinct fulness in the left loin where an ill-defined elastic swelling could be felt. During the first fifteen hours after admission forty-eight ounces of urine were passed, and the elastic swelling in the loin could no longer be felt, only the lower pole of the kidney being palpable. The urine had a dark smoky colour and contained blood and pus cells.

Two fresh facts were now elicited: first, that, contrary to the statement sent in the record of the case, there had not been a blow on the side whilst boxing; and secondly, that at the age of 13 there had been an attack of hæmaturia with pain in the left loin.

An X-ray examination on May 1 showed a dense, rounded shadow opposite the left eleventh rib and the interspace below it, and at a distance of 2 in. from the vertebræ. It was evident that if the shadow was that of a renal calculus it must be lying in the extreme upper end of the kidney, and it seemed advisable to make another examination

after injecting the renal pelvis with collargol With this object a cystoscopic examination was made The orifice of the right ureter looked normal and jets of clear urine escaped from it In the position of the left ureter a small, bladder like projection from the bladder wall periodically appeared and subsided On its surface was a small depression apparently the orifice of the ureter, but all attempts to introduce an ureteral catheter failed The appearance suggested the existence of a stricture of the ureteral orifice with rhythmical dilatation of the ureter behind the obstruction

On May 10 the usual lumbar operation was performed and a large collapsed hydronephrotic kidney exposed, the calculus lying in the highest part of the saccular dilatation Nephrectomy was performed, but on account of the dense adhesion of the upper pole of the kidney a small piece of the wall of the highest sacculus was left The kidney after removal measured 7½ in in length, the hydronephrosis being the result of distension of the renal substance rather than of the pelvis The stone weighed 9 7 grm , it was nearly black in colour, coarsely lobulated and composed chiefly of oxalate of calcium There is nothing of interest to note during the patient's convalescence, except that the urine rapidly became normal in amount and character

The chief interest of the case concerns the diagnosis which was dependent upon an accurate history and an X ray examination If, as was at first thought, the condition had resulted from injury the swelling in the loin might have been caused by a traumatic hydronephrosis or by an extravasation of urine into the perirenal tissue The sudden passage of a large quantity of urine coincident with the disappearance of the swelling showed almost conclusively that the latter was a hydronephrosis It is difficult to suppose that the hydronephrosis was entirely caused by a single calculus lodged in the upper pole of the kidney and the appearance of the lower end of the ureter above described raises the question whether an obstruction in this situation may not have followed the damage caused by the previous lodgment of a small stone

Carcinoma of Sigmoid Colon in a Man aged 18 Years 10 Months

C W signalman reported himself on the morning of January 28 on account of abdominal pain of two or three days duration There was no history of previous abdominal symptoms the bowels had been habitually regular and there had been no diarrhoea or passage of blood The bowels had acted last on January 25, and aperients had been subsequently taken without result The case was at first regarded as one of constipation and colic and was treated accordingly without relief

On January 31 the patient was transferred to the hospital ship "China" On February 4 operation was performed and "an acutely inflamed appendix removed On February 8, no relief having been obtained to the symptoms, the abdomen was again opened in the middle line and an annular stricture of the sigmoid colon, apparently carcinomatous was found The loop of gut including the stricture, was brought out through a separate incision in the left iliac region and the bowel incised

On admission to the Royal Naval Hospital, Plymouth on February 15,

the patient's general condition was satisfactory, and the artificial anus in the sigmoid colon acted well

On March 2 the colostomy was completed by the removal of the loop of bowel which had been brought outside the abdominal wall On laying open the excised bowel it presented a tight ulcerated annular stricture 1 in in length the base of the ulcer being formed by opaque white growth extending into the muscular coat A microscopic examination by Fleet Surgeon H C Whiteside showed the typical structure of columnar cell carcinoma

On May 1 a further operation was undertaken with the object of restoring the continuity of the colon and closing the artificial anus As the first step a curved incision was made through the abdominal wall on the mesial side of the artificial anus in order to determine whether there were any signs of recurrence The result being satisfactory a similar incision was made externally and the artificial anus with an elliptical strip of the skin and deeper tissues completely isolated and drawn out with the upper and lower portions of the gut The latter were then clamped and divided, thus removing the parts involved in the colostomy, and the upper and lower segments were united end to end by a double row of fine thread sutures The wound in the abdominal wall was closed except at the centre where a tube and gauze plug were inserted At the time of writing May 16 free natural motions of the bowel are obtained, and a slight leakage from the wound has nearly ceased

This case is recorded simply on the ground of the age of the patient It is at least remarkable that a youth under nineteen years of age should be able to carry out his duties on active naval service apparently free from symptoms, until suddenly attacked with almost complete obstruction resulting from a carcinoma of the colon We do not know the earliest age at which carcinoma of the sigmoid colon has been recorded but in the rectum the disease, although extremely rare in young adults has in many instances been met with below twenty In one recorded instance the patient was a boy of ten years and the disease had caused secondary growths in the lymphatic glands, liver and mediastinum

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NOTES ON SOME WOUNDED TREATED ON BOARD THE "SAPPHIRE"

By Staff Surgeon THOMAS W MYLES M D F R C S R N

Seventy two wounded soldiers were treated on board this ship, on Monday April 26 They consisted of officers and men from the King's Own Scottish Borderers South Wales Borderers and Royal Marines and were brought off in the ship's boats under my own supervision A rapid inspection of the cases was made and the worst were dealt with at first, as there was no chance of getting them away to a hospital ship for some considerable time and consequently valuable time would have been lost The wounds were severe shock and hæmorrhage were marked The majority occurred in the arm leg and hand and remarkably so in the left upper limb which holds the rifle and is much exposed

A military officer was brought on board this ship by a surgeon from

the "Goliath" He had tried to transport this patient to the hospital ship but owing to shell fire he was unable to proceed, and as we were the nearest ship he brought him on board as he required immediate attention The officer had a small bullet wound 2 in above the symphysis pubis, with a very large and irregular point of exit in left gluteal region Chloroform was administered by Surgeon Evans and with the assistance of the surgeon of the "Goliath" an incision was made through the right rectus muscle when the peritoneal cavity was opened, the wound being enlarged upwards and downwards so as to get free access to the abdomen On exploring it was found that the lower 2 ft of the ilium were perforated in five different places intestine empty mucous membrane everted Each hole admitted the tip of the little finger and at least 4 in of the mesentery was detached from the intestine, necessitating a considerable resection of the gut The bladder was practically torn to pieces and the general condition of the patient bad Under such conditions the patient being beyond the aid of surgical interference was sent back to bed kept under the influence of morphia and discharged at 6 p m to the "Amethyst" for passage to a hospital ship

A private came under my treatment in the same way as the previous case He had received a small bullet wound 1 in above and to the right of the symphysis pubis passing in an oblique direction to a point of exit in the right buttock and producing a very large irregular wound admitting easily four fingers Chloroform was administered as before and on passing a probe it struck me that the wound of the bladder was extra peritoneal With the assistance of the surgeon of the "Goliath" an incision was made through the right rectus and gradually deepened as the wound of the bladder was found to be extra-peritoneal a drainage tube was inserted and the wound partially closed the tissues having been previously washed with saline solution In both these cases blood was demonstrated in the bladder by the passage of a catheter The wound of exit was then examined, and it was found that the bullet had passed in front and to the right of the rectum chipping off a piece of the tuberosity of the ischium The wound was painted over with iodine and brought together with deep sutures, after all haemorrhage had been arrested and a gauze drain inserted morphia ½ gr given

A private was hit in the right wrist by a bullet producing a compound comminuted fracture of the lower ends of radius and ulna and carpal bones necessitating amputation through the middle of forearm this was carried out by a large anterior and short posterior flaps This man also sustained a slight graze of his right ear and shoulder, caused also by a bullet and was treated with a picric acid dressing

An officer sustained a shrapnel wound of the left axilla. The only nerve trunks left were the ulnar nerve and the lesser internal cutaneous The humerus was intact, haemorrhage was severe the axillary vein was torn but the artery was intact Saline and brandy were given, and when the patient had sufficiently rallied a general anaesthetic was administered and the axillary vein ligatured Nerve suture could not be attempted owing to the great loss of nerve tissue On arrival on board the limb was blanched and cold, but on discharge a faint radial pulse was perceptible, and warmth had returned however, I fear that the

case will require amputation through the shoulder at some later date His condition was excellent at 6 p.m., on discharge, considering the loss of blood and shock

A private sustained a compound comminuted fracture of the fourth metacarpal bone of the left hand, and as hæmorrhage was still progressing an anæsthetic was administered and the wound explored The vessels were ligatured and amputation of the fourth finger was performed through the fourth metacarpal bone, iodine dressing and gauze drain inserted

A private received a shrapnel wound in the upper part of the left thigh, dividing the sartorius muscle First aid had been applied but as hæmorrhage was still considerable a general anæsthetic was given Samway's tourniquet was applied and the wound enlarged The femoral vein being partially torn, a lateral ligature was applied. The pubic arch was chipped and on exploring the wound two portions of shrapnel bullets were removed

A private received a bullet wound in the right shoulder not involving the joint making a small point of entrance The missile passed through the anterior border of the right trapezius muscle and across the spine of the right scapula splintering it slightly The wound was 7 in long, the exit being very large and irregular, and there was laceration of the scapular muscles A general anæsthetic having been administered, the wound was thoroughly cleansed the muscles were brought together by deep catgut sutures the skin by horsehair sutures and a gauze drain was inserted

A private received a wound in the left forearm the bullet passing between the bones As there had been a good deal of hæmorrhage and the first aid appliances had been applied so tight as to blanch the limb, it was decided to explore A general anæsthetic was given hæmorrhage arrested, and wound thoroughly cleansed Sensation was good

A private received a shrapnel wound in the upper part of left forearm, fracturing the ulna The wound was explored and cleansed, the fracture set, and the limb placed on a splint A piece of shrapnel was also removed from this wound.

On May 7, 1915, our boats brought off the following cases which were treated on board

A private was hit on the right patella by a bullet which passed obliquely upwards and to the right emerging on the outer side about the juncture of middle and lower thirds of the femur The knee joint was completely disorganized, the femur extensively comminuted, and the muscles terribly lacerated. The femoral vessels were torn across Shock and hæmorrhage were pronounced. A tourniquet had been applied, but evidently a good deal of oozing was taking place from the bone Morphia $\frac{1}{4}$ gr was given and the patient was placed under a light anæsthesia by Surgeon Evans The left median basilic vein was opened and $2\frac{1}{2}$ pints of normal saline at a temperature of 110° F were given with excellent results After considering the grave problem involved in the treatment, it was decided to carry out a rapid amputation through the middle of the thigh by a long anterior and a short posterior flap, blocking the nerves by Crile's method This operation was carried out successfully A slight bullet wound through the fleshy part of the right arm was also dressed and the patient sent back to bed with the

and well [illegible] and with hot water bottles. His [illegible] was good. Pulse small [illegible] low. Saline 1 pint and brandy [illegible] was administered [illegible] at temperature 110° F., was given per rectum at 9 p.m. and [illegible]. At midnight the patient's condition was as good as could be expected, and I had some hopes of a successful result. At 6.30 a.m. unfortunately he had an attack of cardiac failure which proved fatal, having survived the operation by nine hours.

A sergeant was hit in the lower part of the right thigh by a clean bullet. Point of entrance was behind the knee joint passing downwards and forwards, exit being about 4 in. above the joint. There were all the characteristics of a femur fractured in the lower third, viz. shortening and eversion, and evidently the fracture was oblique with very little comminution. An anæsthetic was given, and the wound thoroughly cleansed, deformity reduced, and a long splint applied. This case was sent to a hospital ship next morning. He had also a bullet wound through the soft part of the right thenar eminence.

A private had a bullet wound passing through the outer part of the right foot, close to base of fifth metatarsal bone. There was no fracture. The wound was thoroughly cleansed and dressed. He was also discharged to a hospital ship.

During the operations on the Gallipoli Peninsula the Turks used the nickel-jacketed Mauser bullet, weight 151 gr., length 1 in., and also 0.45 Maxims and 1 in. Nordenfelts, which inflicted particularly severe wounds. Injuries produced by the small calibre bullets maintained an aseptic condition if uncomplicated, while shrapnel and shell wounds without exception became infected and suppurated. The conditions of the wounds varied considerably, the effects produced on the tissues depending upon the velocity with which the bullet impinged, its size, and the resistance encountered, the energy expended being directly proportional to the velocity with which it struck. If the resistance encountered was slight, as in the soft tissues, the damage was slight, while the greater the velocity and resistance, the more pronounced was the shock and damage to the surrounding parts. The explosive effect was most marked at close ranges, and best seen in head injuries and in those of hollow viscera. The feeling described by the men on being hit was that of being struck by a heavy hammer, followed by a dull aching pain. Instances occurred where our troops were hit by expanding bullets, the general opinion being that either the bullet was reversed in its cylinder or that its point was filed down.

Treatment.—It was quite obvious, from the general condition of the wounded, that to expect any fair results active antiseptic measures must be adopted. These men had been forty-eight hours without sleep, fighting hard in heavy marching order, besides having to carry three days' provisions and extra ammunition. Consequently not only were they exhausted and their vitality lowered, but their wounds in most cases were extensively soiled with earth, and from contact with their dirty clothes.

On arrival on board, hot bovril, tea, coffee and other medical comforts were issued and morphia given when required. When the cases came alongside they were hoisted up in a cot carrier and placed under an awning. The captain's cabin made an excellent operating room, having

[illegible] light and cool [illegible] obtaining a minimum of furniture. Towels were sterilised [illegible] and then wrung them out dry. In nearly all cases [illegible] anæsthetic was administered, and in cases of injury to the [illegible] this was done previously to moving the patient to the operating table. The clothes having been removed the surrounding parts were cleaned up with soap, warm water and a nail brush and shaved. The wound was then thoroughly washed out with lotio carbolic 1 in 20, followed by sterile water, finally dehydrated with spirit and painted over with iodine. Rough usage of the tissues was avoided as much as possible, soiled edges of the wound and tags of tissue being removed by the scissors. Drainage was employed in all cases, and each received a prophylactic dose of anti-tetanic serum and anti-sepsis vaccine before leaving the table. They were then placed behind a screen, and when consciousness returned were removed to the upper deck beneath an awning, where bovril, soup, &c., were given to them. Three cases of abdominal wounds came under my notice, but in all cases peritonitis was well established and the patients were moribund. Morphia was given freely and every comfort to ease their sufferings. During this period the ship was continually in action, supporting the left flank of the army.

In all cases this treatment was thoroughly carried out in the field, iodine being applied to the wounds, and in most cases hæmorrhage was effectively controlled. In some instances the tendency was to apply the tourniquet too tight, and in these the limb was blanched and the patient suffered considerable pain.

Orders were received to send wounded to a transport for passage to hospital. They left us at 6 p.m., after having been ten hours on board, and when they were discharged their general condition was very satisfactory and their *moral* splendid.

A CASE OF CAISSON DISEASE

By Surgeon-General DONALD T. HOSKYN, M.B., R.N.

The following case of caisson disease, compiled from notes by Staff Surgeon L. Hunt and Surgeon E. Moxon Browne, is of interest, for though on admission to hospital the patient appeared to be suffering from serious damage to the central nervous system of such gravity that he was thought to be moribund, he made a complete recovery with little more than symptomatic treatment.

The patient, a chargeman of shipwrights, aged 39, of heavy build, who had the appearance characteristic of a fondness for good living, on October 7, 1914, was employed in attempting to find and recover a 6-pounder gun which had been lost overboard from a destroyer near one of the outlying islands west of Hong Kong. Staff Surgeon L. Hunt, responding to a telephone call received at 7 p.m., proceeded to the destroyer and, on arrival two hours later, learned that the patient had commenced diving at about 1 p.m. and finished at 5.5 p.m., during which period he had gone down twice, on the first occasion for one hour forty minutes, and after a short interval for three-quarters of an hour. These times were only approximate as they had not been checked in any way.

but he came direct to the surface after each immersion without any pause in the ascent. The depths were given as about 9½ to 11 fathoms. On coming to the surface at 5.5 p.m., he seemed to be all right, and undressed but about half an hour later complained of abdominal pains and commenced coughing. He then rapidly became faint and as soon as possible he was dressed and sent down again. Before this was accomplished he was quite unconscious. He was lowered to 9½ fathoms, and after being kept there for half an hour was gradually raised to the surface, the total immersion lasting for about one hour. When at the surface the face piece was removed but he was "not properly conscious" and was therefore sent down again to 9 fathoms, kept at that depth for one hour and then brought up, with long pauses at every 10 ft. During this immersion he answered the telephone and on return to the surface was conscious and had lost all pain.

When Staff Surgeon Hunt first saw him he was on a camp bed on the upper deck and several persons were applying friction to his limbs. He was pale, the mucous membranes were slightly cyanosed, the extremities were cold, and the pulse at the wrist very feeble, about 100. It was considered that the time of re compression had been insufficient but as he had improved considerably a hypodermic injection of strychnine and digitalin was given and he was surrounded with hot water bottles and covered with blankets. He soon improved, but it was noticed that he gradually became very irritable, answering questions abruptly, and eventually presented the characteristic appearance of a patient suffering from cerebral irritation. He had full use of all his limbs, but would not grasp with his hands. During the return of the destroyer to harbour, all signs of collapse disappeared and the patient became very restless and kicked about violently. His replies to questions became slower and later his speech was noticed to be thick.

On return to Hong Kong, Staff Surgeon Hunt asked Surgeon Duck of the R.F.A. "Delta" to meet him in consultation and it was decided to recompress the patient. He was therefore sent down 40 ft. and kept at this depth for fifty minutes, during which he reported himself as "all right," but another diver who had gone down with him reported that he was "very bad." At the end of this period he was slowly raised 10 ft., when he again reported himself by telephone as "better," and "all right." He was kept at this depth for ten minutes and then raised 10 ft. and kept twenty minutes, then raised another 10 ft., where he was kept for ten minutes, and then brought to the surface. At first he seemed somewhat collapsed and slightly cyanosed and though there was an early improvement, he gradually became semi conscious. Soon after 3.15 a.m., restlessness again commenced and at 5.30 he could be kept in bed only with great difficulty. A hypodermic injection of morphia gr. ¼ and atropine gr. 1 in 50 had no effect. He was brought to the Royal Naval Hospital at 7 a.m., struggling so violently that he had to be secured to keep him in the cot.

On admission to hospital it was noticed that the patient was very restless, moving his head rapidly and violently from side to side. His right lower limb and right forearm were also in incessant motion; pulse rapid, uncountable and very irregular; temperature 101° F. The patellar reflexes could not be obtained on the left side because of rigidity and on the right owing to the movements, nor could the action of light on the

pupils be observed. Babinsky's sign was negative on the left side. The patient's attention could not be roused by shouting into his ear and he seemed to be insensible to pain. It was impossible to give anything by the mouth, and he appeared to be dying. His head was shaved, an ice bag was applied to his head and mustard leaves to his calves.

At 10 a.m. the general condition remained the same. It was then noticed that Babinsky's sign was positive on the left side; there was analgesia in the left upper and lower limbs and signs of commencing left facial paralysis. At 4 p.m. the pulse was markedly stronger and he seemed to hear when his name was shouted into his ear, but otherwise his condition was unaltered. At 6 p.m. the pulse was still better, 124; temperature 100.4° F., but the restless movements continued.

It was proposed to use a catheter at 9 p.m., but at about 8.30 the urine was passed involuntarily. The movements were then not so violent. With some trouble he was induced to swallow calomel gr. iv, and a few ounces of milk.

During the night the movements gradually ceased and the patient slept for about three hours. While asleep he again passed urine involuntarily. On the following morning his temperature was 98° F. and pulse 92; the patient was lying quietly in bed with eyes closed, but recognized his name and understood and answered simple questions very slowly; he opened his mouth when told to do so, had power over the left lower but was apparently unable to move the left upper limb. He was ordered milk 2 oz. every two hours and mag. sulph., sod. sulph. aa ʒi, aqua chlorof. ℥i t.d.s. The improvement continued during the day, and that evening he passed urine voluntarily. On October 8 he was able to speak naturally and complained only of being tired. He seemed to have almost complete power over the left upper limb, but the hand grip was weak. From this date he improved in every respect and was discharged to his home on October 16, the only sign of his recent illness being slight weakness of his left hand.

He was forbidden to dive for at least six months. On May 6, 1916, after examination, he was again passed as fit for this duty.

MEDICAL GUARD

By Fleet-Surgeon W. J. COLBORNE, R.N.

The medical guard is a concession allowed by the Admiralty at the discretion of the senior naval officer of the fleet or squadron, and is not included in the King's Regulations. As very few instructions are laid down in local port orders, &c., with reference to this guard, I state below some details and what is the custom of the Service with regard to it:

(1) The medical guard is detailed each day, in some cases for the week, by the senior naval officer's ship of the squadron present. The medical officer of this ship is sometimes consulted but not necessarily so, because, for convenience of boats, &c., the medical guard is generally given to the ship having the general guard duties.

(2) The ship having the medical guard flies a distinctive flag, and that ship must have a medical officer on board available at all times for

calls to other ships of the squadron this squadron generally consists of four ships if a seagoing squadron In a dockyard or home port the medical guard is generally detailed for a certain group of ships, or even a district

(3) The medical officer of the guard must answer all calls, whether they are to his own squadron or not

(4) The medical guard is taken for twenty four hours, generally from 9 a m to 9 a m

(5) Ships coaling should not be given the guard if it can be avoided, if it is so given and two medical officers are borne, both must remain on board until the coaling is finished

(6) Ships should take the medical guard in rotation regardless of the number of medical officers borne, i.e. with two ships present, one with one medical officer, and the other with two the ships take the guard day and day about

(7) The guard is kept by the junior medical officer of the ship unless the senior medical officer wishes to do so by mutual arrangement with his junior

(8) It is inadvisable to change the ship to which the medical guard has been given if it can be avoided after the signal has been made, as it upsets the rotation and interferes with the arrangements of the other medical officers of the squadron If a change is really necessary it is better to ask another medical officer to take the guard for that day in addition to his own for that week and so avoid alteration of the rotation

(9) Ships having the guard should have two sick berth ratings on board if the number borne will permit as a rating may be required to take a case to hospital or to take charge of a case in a small ship which has no sick berth rating on board

(10) When called to another ship, care should be taken to write full details of the case in the day book, for the information of the medical officer of that ship on his return

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ALTERATIONS IN THE BRITISH PHARMACOPŒIA 1914

By Fleet Surgeon MONTAGUE H KNAPP R N

The following notes on the most important alterations in the new Pharmacopœia may be of use to readers serving afloat or abroad

The Metric system is now used throughout and the Imperial system of weights and measures altogether omitted except in expressing doses, which are still given in both systems

The unit of mass in the metric system is the gramme, which equals 15 4324 grains, and its subdivisions are the decigram, centigram and milligram

The unit measure of capacity is the millilitre, which for all practical purposes is equivalent to the cubic centimetre and equals 16 9 minims The term mil is officially authorized as an abbreviation for millilitre, its subdivisions being the decimil and centimil

It will be noticed that the official dose has not always been altered to correspond with the alteration in strength

Alterations in Strength

	Strength compared with B P 1898	Dose		
	Stronger			
[illegible]	[illegible] times as strong	5 [illegible]		[illegible]
[illegible]	Three times as strong	[illegible]	Repeated	[illegible]
		5—15	Single	5
[illegible]	[illegible] stronger	5—15	Repeated	No change
		20 30	Single	[illegible]
[illegible]	[illegible] 1/10 more [illegible]	30—60		
Acid [illegible]	[illegible] as strong	10 30		5 [illegible]
Spt [illegible]		20 60		[illegible] 20
Syrup [illegible]	[illegible] per cent	30—120		No change
	Weaker			
Acid [illegible]	[illegible]	[illegible]		No change
[illegible]	[illegible]	[illegible]—2		
[illegible]	[illegible]	[illegible] 20		
[illegible]	Half	[illegible]—[illegible]		[illegible]
[illegible]	Half	3		[illegible]
Liq [illegible]	[illegible]	15 60		No change
[illegible]	[illegible]	10 30		
Pil phosph[illegible]	Half	1 [illegible]		[illegible]
Tabell[illegible]	[illegible]	[illegible]		No change
Tinct bell[illegible]	[illegible]	5—15 [illegible]		
[illegible]	Half	[illegible]		—
[illegible]	[illegible]	5 [illegible]		—
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible] 10		
Troch [illegible]	[illegible]	1 gr in troch		[illegible] troch
Syrup [illegible]	[illegible] per cent	30—60 mins		No change
Spt aetheris [illegible]	[illegible] strength	20—40		[illegible] 60 mins
	[illegible] dose altered	60—90		[illegible] 10

External Applications

Ointments [illegible] in strength	*Alterations*
Ung hyd[illegible] chlor	Now twice as strong
„ [illegible]	Increased in strength by one third
Ointments decreased in strength	
Ung hydr[illegible]	Now half as strong
„ hydrarg	Decreased in strength 58 per cent
„ do	„ „ 88
„ acid carb [illegible]	„ „ 95

Tinct iodi fort now replaces liq iodi fort of the 1898 B P with which it is practically identical, and it also corresponds to the old linimentum iodi of the 1885 B P

Tinc. iodi mitis is the new name for tinc iodi B P 1898, in which there is no change

Emplastrum belladonnæ is now only half as strong as formerly There are now only two official extracts of belladonna instead of three, viz (1) extract belladonnæ liq made from the root, in this no change has been made, (2) ext belladonnæ siccum made from the dried leaves, replaces ext belladonnæ alcoholicum, made from the root,

and ext belladonnæ viride both these are of the 1898 B P., the latter being the preparation supplied to the Service afloat Ext belladonnæ siccum is also called ext belladonnæ and ext belladonnæ alcoholicum

Amongst the new drugs added are veronal and urotropine now officially recognized and called barbitonum and hexamine respectively, and acidum acetylsalicum the chemical name for aspirin

ANOTHER SCUTTLE VENTILATOR

By Fleet Surgeon BOBLEY BROWNE R.N.

Sharing the privilege with Fleet-Surgeon Montague Knapp of serving in one of the ' older men of war ' I was much interested in his article in the April number of the Journal on A Scuttle Ventilator

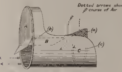

Fig. 1 Sketch showing wind scoop with baffles in place

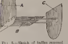

Fig. 2.—Sketch of baffles removed from wind scoop

Fig 3.—Section of wind scoop showing thin angle plate (c) behind baffle C

In this ship (' Hyacinth ') the problem has been successfully dealt with by Engineer Commander F J Roskruge, and I think his invention is well worth placing on record, more especially for use on hot weather stations when a maximum amount of air is usually a luxury, and

appreciated as such during winter in the North Sea the same quantity might quite possibly be insultingly termed "a draught!"

Should at any time the supply of air be really considered excessive, the inlet can be graduated by rotating the scoop.

I have been using some of these ventilators in the sick bay here for several months to the satisfaction of the military critics and the great benefit of patients

DESCRIPTION OF VENTILATOR

The subjoined sketches by Engineer-Commander Roskruge show an arrangement of baffles fitted to enable the ordinary "Service" wind scoop to be used for purposes of ventilation when ships are "darkened"

The baffles (made of tin) are three in number an inner (A) an outer (C), and a central (B), *vide* fig 1, which shows the wind-scoop with baffles in position Certain fittings require to be riveted to the standard pattern wind scoop —

(1) Small side plates (fig 1, a) to prevent the escape of light at the sides of the outer baffle (C)

(2) Guides (b), of thin angled plate to support the central baffle (B)

(3) A semicircular angled plate (c) about an inch deep, to prevent the escape of light around the outer baffle (C)

All these three baffles can be connected together as shown in fig 2 they can then be withdrawn bodily to allow the wind scoop to be used in daylight in the ordinary way

If preferred, the outer baffle (C) need not be attached to the central one; in that case small clips (to hold it in place) must be riveted to the wind scoop, close to plate (c), as shown in fig 3

The distance between B and C should be 12 in, the length of B 7 in, and the height of C 10 in, this effectually prevents the escape of any direct rays of light The interior of wind scoop and baffles should be painted a dull black

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AN IMPROVISED CENTRIFUGAL MACHINE

By SURGEON A A. SANDERS M B R.N

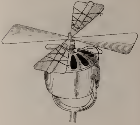
THE absence of a centrifugal machine has often been noticed on board H M ships and as one is not supplied I have frequently used the method described below with satisfactory results

Take an ordinary electric table fan and place it on a firm table with the blades horizontal or only slightly tilted Tie on to each of two opposing blades a test tube firmly corked containing some of the fluid to be centrifugalized—taking care first to tie a complete loop round the neck of the test tube just below the everted lip with a firm knot—then complete the fixation as in the diagram

Let the fan run at a medium speed for half an hour or so and it will then be found that a firm deposit has been formed The wedge shape of the blades precludes the possibility of the tubes flying off After stoppage

of the fan, the deposit will be found to be sufficiently firm to prevent its being disseminated whilst the tube is in a stationary horizontal position pending its removal for examination purposes

Recently, a very small but highly important degree of hæmaturia was discovered by this method, when by other methods it could not be detected



Reviews.

SANITATION IN WAR. By Major P. S. Lelean, F.R.C.S., D.P.H., R.A.M.C., Assistant Professor of Hygiene, Royal Army Medical College. London: J. and A. Churchill. 1915. Pp. 267. 39 illustrations. Price 5s. net.

This book, which can be comfortably carried in the tunic or jacket pocket, consists of nine admirably concise lectures on that all-important subject, "The Prevention of Disease among Fighting Men in the Field." These lectures were given primarily with the object of assisting civilian practitioners who had left their normal vocation for the unaccustomed and strenuous labours of campaigning, to carry out their new duties armed with that amount of knowledge which is essential, not only to their own peace of mind, but also to the welfare and fighting efficiency of the officers and men placed under their care.

The first lecture dwells on physical fitness for war, and the unfitness of the recruit is considered from both the physical and psychological aspect. The former concerns the medical officer, and the latter his combatant colleague only. The recruit having passed the examination test, has to be trained to enable him first to march, and next to fight. The training must fit muscles, heart, respiratory capacity, and excretory organs for the task before them by graduated, varied, and interesting exercises. Signs of successful training and indications of excessive strain are described. The chief factors in the health of the men actually at the Front are food, clothing, equipment and comfort. The caloric value of field rations has been the subject of experiments to people by marches under war conditions, and from the result of these the present ration has been evolved. The vexed questions of alcohol and tobacco are judicially discussed in this section. Methods of determining the quality and condition of tinned rations are described at some length. In the section on clothing, the fallacy of the red clothing theory is exposed, and the value of woollen material in both summer and winter campaigns is well demonstrated. Boots, frost bite, and the washing and repair of clothes naturally receive the attention to which such subjects are entitled in a work of this description. Equipment is tersely but adequately dealt with; and under the heading of comfort we are shown how cleanliness, warmth and suitable mental occupation make for fighting efficiency. In the chapter on Anti-typhoid Inoculation, the author considers (1) the general principles of active immunization, (2) the application of these principles to the problem of protection, and (3) the scientific and practical results obtained. Valuable hints are given here as to the best methods of inducing the men to seek this protection. Perhaps the most interesting of these lectures is that entitled "The March," especially that part of it which deals with practical considerations of food, drink, clothing, care of feet, halts and conservancy. In the lecture on Sickness in the Army, statistics marshalled in a most graphic manner with diagrams and charts clearly demonstrate the success which has attended sanitary efforts during the half century 1855 to 1905. Historic losses from sickness in the wars of the past century and factors determining the

high sickness incidences of war are related in a manner which clothes the subject with great interest, while a study of the methods of investigation, report on, and record of cases of infective disease in the field will repay the reader. The fifth lecture deals with the rôle of insects in war and contains a description of the morphology and habits of the fly as bearing on the problems of fly borne infection. Nine pages are devoted to protective measures against such infection and against vermin.

The sixth lecture covers the whole ground of medical organization and administration in the field. Conservancy in the field is the subject of the seventh lecture, while the last chapter in the book, comprising two lectures, is devoted to water and water supplies. The water requirements of a military force, the best sites for sinking trial borings the examination of water sources, and the best methods of estimating the yield of water are fully discussed from a practical point of view. The theme of water purification is thoroughly traversed, and the present means of obviating the immense difficulties confronting the sanitarian in the field are explained by means of good illustrative diagrams. Naval officers must at all times be prepared to take the field on shore at very short notice, and we think that in such emergencies this book will be found invaluable, as it affords precisely that kind of information which is not provided in other text books, and which is gathered from an actual experience of practical problems. R. C. M.

Health in the Camp. By H. R. Kenwood, Temporary Lieutenant Colonel, R.A.M.C., Professor of Hygiene and Public Health in the University of London. London: H. K. Lewis and Co., 1915. Pp. 58. Price 3d. net or 100 copies 21s. net.

This little work is a popular treatise on hygiene addressed in simple language to the rank and file. The writer conveys in a most concise form that which every soldier and sailor ought to know. It is true that lectures are given in both Services on elementary hygiene but many men derive greater profit from a perusal of the printed page than from the most eloquent speech, and most men learn nothing until they have both listened to and read words of wisdom. The essence of the teaching of this work is summed up in one sentence: "The obedient and intelligent co-operation of every single soldier is demanded if the sanitation of the camp is to be what it ought to be." Rules, regulations, patrols, and even punishment are of small avail unless the men understand the need for sanitary discipline, and are in sympathy with it. In these few pages the author explains the significance of hygienic rules, and gives many useful hints on how to avoid disease when campaigning. Any medical officer who wishes to vary or enlarge on his hygiene lectures to the men would derive much assistance from this pamphlet. It would be invaluable to surgeons and company officers of the Royal Naval Division. Whatever profits result from publication are to be paid to the Soldiers' and Sailors' Families Association. R. C. M.

Aids to Surgery. By Joseph Cunning, M.B., B.S., F.R.C.S.Eng. Third Edition. London: Baillière, Tindall and Cox, 1913. Pp. xii and 230. Price 3s. 6d. net (cloth) 3s. net (paper).

In the third edition of this little book the author has incorporated most of the recent advances in surgery, and has brought it thoroughly

up to date Though intended essentially for students, and one of the Student's Aids Series, it contains a very large amount of compressed information which is set forth with great judgment.

The earlier chapters are devoted to general surgical conditions (including infective diseases, tumours and cysts), and then the various regions and structures of the body are taken systematically, the whole being dealt with in as thorough a manner as a book of this character permits

This little work can be strongly recommended, and, if used as its title implies, will be found extremely useful for refreshing the memory and economizing time W L M

MANUAL OF SURGERY By Alexis Thomson F R C S Ed, Professor of Surgery University of Edinburgh, Surgeon Edinburgh Royal Infirmary, and Alexander Miles, F R C S Ed, Surgeon Edinburgh Royal Infirmary Vols i and ii Fifth Edition Edinburgh, Glasgow, and London Henry Frowde and Hodder and Stoughton 1915 Vol i, pp 801 Vol ii, pp. 946 With 590 illustrations Price 10s 6d net (each vol)

It would be needless on our part to enter into a detailed description of this well known and widely read book, it will suffice to allude to the more important of the many developments presented in the present enlarged and revised edition

The whole of the text has been carefully revised, and various sections have been completely re written to bring them into line with recent advances in pathology and treatment By eliminating, as far as possible debatable questions, and such subjects as can only be taught practically in the wards of the hospital, new matter has been incorporated without materially adding to the size

The illustrations throughout are excellent and convey valuable information, the majority being from original drawings or photographs of the authors, many new illustrations have been added which increase the value of the volumes and a considerable number of the woodcuts used in previous editions have been replaced by process blocks

Vol i is devoted to general surgery and vol ii to regional surgery—the whole being dealt with in a systematic and thorough manner A distinctive feature in the present issue, and we venture to think an improvement, is the omission from vols i and ii of all descriptions of operative procedure we learn from the preface that the authors have compiled a third volume dealing exclusively with operative surgery In a book of this kind one sometimes finds and expects to find, degrees of excellence in different sections in accordance with the author's special learning, to a given area or region where he has done most of his work Here it is difficult or impossible to point out any specialized portion, all is good and up to date Perhaps chapter xxi (vol ii) on the abdomen and pelvis is one of the best The surgical anatomy, given at the opening of the chapters in vol ii, and of many in vol i, supplies the reader in a concise form with just what he requires to refresh his memory

The already high quality of this work is greatly enhanced in the Fifth Edition, as a manual of surgery for general use, it is unsurpassed at the present day W L M

A SIMPLE METHOD OF WATER ANALYSIS By J C Thresh M D D Sc D.P H London J A Churchill Eighth Edition, 1915 Pp 65 Price 2s 6d net

The fact that this little book has reached its eighth edition, indicates that it is widely appreciated The use of soloids for analyses is of great convenience but the results are not always reliable, unless in the hands of an expert and carefully checked The analyst is recommended to bear in mind the advice given in the introduction that the source of the water and the local conditions under which it is stored must be carefully considered before reporting on a water In this edition a chapter has been added on the purification of water by the chlorine process, by means of which a polluted supply may be made fit for use P W B S

RELIGIO MEDICI MODERNI By Neo Kama, M D Lond John Bale Sons and Danielsson London 1915 Pp. 118 Price 2s 6d net

The author gives in a series of essays his own views on religion and the experiences he himself has suffered or enjoyed in a somewhat chequered spiritual career He describes himself as "old and " rapidly approaching the scrap heap " consequently it may be inferred that he is experienced ; his writings at any rate show that he has expended very much more time, energy and thought on philosophic doubt than most intellectual men allow themselves in these days of breathless hurry and busy materialism Apparently in his youth a study of the first principle of modern biology and geology forced on him the conclusion that man had not fallen from a higher state, but had risen from the lowest. Therefore he argued there was no need for the Redemption and hence for him the whole Christian fabric fell to the ground Having purged himself of what he is pleased to call old dogmas he adopted Dalton's theory of atoms as a new irrefutable dogma but when science declared that atoms were resolvable into electrons then the even tenor of his beliefs was upset Even now he only *thinks* he is happily settled in pantheism of a peculiar brand His first essay is on Clergy, who are no better and probably not worse than other men in spite of the temptations of their calling which are strongly provocative of unintentional hypocrisy Next we have a discussion of the Life Hereafter, which is believed in to a limited extent The chapter on Divine Intelligence makes one realize that the author is painfully struggling back to the light through the mists of doubt Spiritualism is dealt with in a masterly fashion, which must gain our admiration The essay on Religion and Sex is instructive and the remarks on Emancipation of Women would make even Mrs Pankhurst pause to wonder whether after all the militants are right or wrong in their methods and aims To medical men the essay on Death is full of interest, and here the author rises to lofty heights of philosophy, yet his theories are cheerless, cold and inhospitable With the sentiments expressed in the short chapters on Ambition and Morality we are in full agreement The book is one to be read on a long voyage and offers unlimited food for post prandial wardroom discussions in peace time, but at present we fear it will nowhere receive the attention to which its literary merit entitles it R C M

Abstracts and Translations.

[illegible] M.) On Certain Antiseptic Substances, containing, [illegible] in the Treatment of Wounds. Translated from [illegible] *de l'Académie des Sciences*, t. 161, p. 150, séance du [illegible]

[illegible] germicidal power of the majority of antiseptics relatively [illegible] reduced, as is known, when they act in the presence of serums or other matter containing protein. It is probable that the destruction of micro-organisms is due chiefly to a chemical reaction between the antiseptic and the microbian proteins. In research for an antiseptic substance destined for the treatment of infected wounds it seems that the following points are of great importance:—

(*a*) The use of substances endowed with a germicidal power so high that even when their activity is reduced by the presence of serums or other protein matter they still possess a powerful antiseptic action. In other words, to employ substances which after combination with protein matter give compounds remaining actively antiseptic. As an example of a body which by no means fulfils this condition, bichloride of mercury may be mentioned.

(*b*) It appears that soluble salts not precipitable by protein matter, which can in a certain measure penetrate the tissues and be absorbed by them, are preferable to the substances in which power of penetration and absorption by the tissues is less marked.

(*c*) The toxicity of an antiseptic and its irritant local action ought to be as feeble as possible in comparison with its bactericidal activity. This condition permits the employment without danger of sufficiently large quantities of the substance. If the germicidal action of an antiseptic substance is the result of a chemical action in which takes part other protein matter than the bacterial protein matter, it is very important that the quantity of the substance should be as large as possible.

Among the antiseptics which have already been studied in the treatment of infected wounds, the hypochlorites especially fulfil the conditions which have just been enumerated. But unfortunately the hypochlorites of commerce have a very inconstant composition. Such solutions are irritant. When they are used even with a moderate concentration they can produce less favourable results. It was then useful to discover a means of preparing a hypochlorite of constant composition possessing a great bactericidal activity and a feeble toxic and irritant action on the tissues. This result has been attained by the following method:—

[illegible]

w th a solut n of hor [illegible] th (31 gm per litre) I the preparation [illegible] which contains about 5 in 100 of hypochlorite a exce [illegible] But, if the solution is a more concentrated [illegible]

A solution thus prepared [illegible] staphylococci in two hours with a concentration of hypochlorite [illegible] while in presence of blood serum the concentration of hypochlorite should in order to produce the same result [illegible] It has been found that this solution is a very useful antiseptic in the treatment of infected wounds, when it is applied after the method [illegible] and used by Dr Carrel

Wounds can be irrigated continuously for several days by means of this solution without marked irritation of the skin The bacteriological examination of secretions from wounds has shown that the solution possesses an energetic antiseptic power Moreover, the solution has the property of dissolving necrosed tissue and also a certain hæmostatic action

It is probable that the action of hypochlorites is due to the chlorine they contain which can replace the hydrogen in the groups (N.H) of proteins, forming substances belonging to the group of chloramines It was interesting to investigate the action of these substances With the co operation of Professor J B Cohen, of the University of Leeds a great number of these derivatives have been prepared and studied The most encouraging results have been obtained with sodium salts of aromatic sulphochloramides and in particular with the derivatives of benzene and toluene

Benzene sodium sulpho chloramide

Paratoluene sodium sulpho chloramide

The substances act on the tissues as powerful, and very slightly toxic antiseptics Their aqueous solutions can be employed in the treatment of wounds with a stronger concentration than the hypochlorites As the chlorine is already tied to nitrogen in these substances they have not the property of dissolving necrosed tissue The paratoluene sodium sulphochloramide at a concentration as low as $\frac{1}{1000000}$ kills, in two hours *Perfringens* B in suspension in water whereas if the *Perfringens* is in presence of horse serum, the concentration of the substance should be raised to from $\frac{1}{2000}$ to $\frac{1}{3000}$ to produce the same result Staphylococci, in suspension in water are killed by a solution from $\frac{1}{1000000}$ and, in presence of horse serum by a solution at $\frac{1}{1500}$ The sterilization is complete in two hours

An aqueous solution containing 1 in 400 paratoluene sodium sulpho chloramide can be applied to a wound without appreciable irritation

These substances, having a marked hæmolytic power, should not be injected into veins W L M

SHAW (T B) Staff Surgeon R.N The Early Diagnosis of Syphilis *The Journal of State Medicine*, September 1916 vol xxiii No 9

In the author s opinion the modern methods of diagnosing syphilis in its earliest stages are not yet sufficiently recognized or applied, after an experience of more than three years at the Royal Naval Hospital,

Reader, two facts above all others remain stamped on his memory (1) The great value of salvarsan or neo salvarsan early in the disease (2) the great importance of an early diagnosis of syphilis Patients are still too frequently sent to hospital with secondary signs already well developed who have had no specific treatment except perhaps, lotio nigra locally

The value of salvarsan and neo salvarsan is directly proportional to the stage of the disease in which they are given, and the earlier treatment is commenced the greater the chances of complete cure.

Every sore should be treated with a simple lotion or powder until frequent examinations have been made for the *S pallida* lotio nigra or ol hydrarg perchlor should not be used until the spirochete has been found or a diagnosis of syphilis made by other means He considers that the Burri indian ink method of demonstrating the spirochete is the most suitable for use on board ship and recommends the following procedure To obtain the serum the sore should be carefully washed with pledgets of cotton wool soaked in sterilized water, preferably sterilized and as much as possible of the superficial débris removed The object is to get a serum free from débris, blood, or pus so the preliminary washing is of the greatest importance Then direct the patient to squeeze the sore *gently* by means of the thumb and forefinger of each hand (the pressure must be small, else pure blood only is obtained) after a varying time, in some cases not for five or ten minutes sufficient serum exudes with patience it will rarely be necessary to scarify the sore The serum is taken up in a capillary pipette and transferred to a clean glass slide a drop of indian ink is quickly taken up in a platinum loop, mixed with the serum and the mixture is then spread evenly with the aid of the loop or the edge of another slide A frequent source of trouble is the use of too much ink but after a little experience the correct amount is easily judged

An indian ink preparation should be examined for at least thirty minutes before deciding that no spirochetes are present If negative frequent examinations should be made from day to day

All patients suffering from primary venereal sores, where spirochaetes have not been found, should have samples of their blood tested weekly Also in these negative cases it is well to have a "Wassermann" done two or three months after the sores have disappeared, to exclude definitely the possibility of syphilis

The aim should be to diagnose syphilis early, if possible in the primary stage before the Wassermann reaction is positive W L M

COTTLE (G F), Passed Assistant Surgeon, U S N The Damage of Syphilis to the Navy *United States Naval Med Bull*, July 1915 vol ix, No 3

In spite of all efforts towards prevention, syphilis still stands near the top of the list of diseases which cause a large number of sick days in the Navy A reduction in the incidence of syphilis has been brought about by the use of calomel ointment as a preventive, which is efficient though there are inherent difficulties in its universal application Additional measures must be found if the damage to the Service occasioned by this disease is to be reduced

Of a total of [illegible] sick days for syphilis in the Navy [illegible] 56 963 were sick days in hospital or hospital ship [illegible] in sick days has not been reduced in proportion to the new discoveries in accuracy of diagnosis and [illegible] rapidity and certainty of cure

For primary syphilis he estimates [illegible] sick days is the necessary average for a patient and believes that except in unusual circumstances, syphilis can be treated on board at the station or yard and that such cases need not be sent to a hospital It is hoped that in time neo-salvarsan or salvarsan will be issued to every ship and station the administration of these drugs is as practicable on board ship at the station or yard as at a hospital Now that the soluble and simply prepared solution of neo salvarsan has appeared the necessity for normal salt solution made with chemically pure sodium chloride and the careful neutralization with potassium hydroxide has gone Only the most simple apparatus is needed a large glass funnel a rubber tube, a needle to enter the vein a medicine glass a glass rod, and a bottle of freshly distilled water are the essentials The distilled water of the ship may be sterilized and then used the only precautions being the silver nitrate test of the water in the evaporator room by the medical officer and the use of this specially tested sample on the day it is obtained

The importance of an early diagnosis is emphasized as a simple method of detecting the *Treponema pallidum* that of C Burt (*Journ R y Army Med Corps*, xxii No 3, March, 1914) is quick easily obtainable, and certain

The author concludes that sick days in hospital for this class of patient should be reduced to a minimum that except in unusual cases syphilis should be treated aboard ship or at the station or yard that the early discovery of the treponema is now practicable that neo salvarsan should be issued to all ships and stations and that these measures if carried out will do much towards reducing the sick days now yearly charged to syphilis W L M

Carnot (P) and Weil Halle (B) Culture en "tubes de sable" pour le diagnostic rapide de la Fièvre Typhoïde et le dépistage des porteurs de germes *Comp Rend de l Acad des Sci*, 1915, vol clxx p 148

The following method has been found useful in routine laboratory work for the rapid identification of typhoid bacilli from the faeces It depends upon the more active motility of the typhoid germ than that of other intestinal bacteria A U shape tube of 6 mm diameter is made filled with nutrient broth and a small quantity of sterile fine sand is added to one arm this when settled down forms a fine filter layer above the bend of the tubes The tube is again sterilized, and the other upright is inoculated with a loop of faeces, incubated at 37 C for eighteen hours after that time the inoculated arm above the sand will usually appear turbid and even when clear may show some motile bacilli if the faeces contain typhoid bacilli The organism is further tested by agglutination with specific serum and by culture methods If examination is not made till later *B coli* and other organisms may penetrate through P W B S

ORTICONI. Bouillon d'hémoculture pour le diagnostic et l'identification rapide du bacille d'Eberth et des Bacilles paratyphiques. *Comp. Rend. Soc. Biol.* May, 1915, vol. lxxviii.

The author recommends the following method: [illegible] broth 1,000 c.c. with glucose 2.5 gr. is sterilized for half an hour at 110° C. and divided up in flasks of 100 c.c. When required [illegible] or 3 c.c. of filtered and sterilized ox bile is added. In this medium both typhoid and paratyphoid organisms grow rapidly, the paratyphoid giving rise to the production of gas, which quickly distinguishes typhoid from paratyphoid A and B infections. P. W. B. S.

SARTORY (A.) and LASSEUR (P.). Le citrate de soude et l'agglutination du bacille typhique. *Comp. Rend. Soc. Biol.* 1915, vol. lxxviii, p. 36.

Many reagents are able to cause agglutination of bacteria like that which is produced by specific serums, such as formaldehyde, perchloride of mercury, sulphate of ammonia, acetic and lactic acids, watery solutions of some aniline dyes, &c. As citrate of soda is a frequent addition to samples of blood sent from a distance for laboratory examination, the authors have tested specimens, as ordinarily diluted with the solution, for agglutination with *Bacillus typhosus*. They found that 5 per cent. solution of sodium citrate had no agglutinative power, that when added to normal serum it does not cause this to agglutinate the bacillus, but that it appears to strengthen the reaction of a feebly agglutinating serum. P. W. B. S.

CASTELLANI, ALDO. Note on Paratyphoid Vaccination with Mixed Vaccines. *Centralbl. f. Bakt.* 1914, vol. lxxii, p. 67.

For a considerable time Castellani has advocated mixed vaccines in areas where both infections are common. He has used several thousand inoculations of both killed and attenuated vaccines without giving rise to more severe reactions than with the ordinary method. The immunity produced is good against all the organisms, the agglutinative results obtained were similar to those found when the vaccines were given separately. He recommends for general use a vaccine killed at 58° C., containing 500 million typhoid and 250 million of each paratyphoid in 1 c.c., the first dose being 6 c.c., the second 1.2 c.c.

(N.B.—For general purposes it is recommended in the Royal Navy to give the two separate immunizing doses of typhoid vaccine, and a third inoculation of 500 million each of the paratyphoid organisms, and these should if possible be strains from the endemic area.)

P. W. B. S.

DYER (A. W.). The Agglutinative Reaction after Anti-typhoid Inoculation. *Indian Journ. Med. Research*, April, 1914, vol. i, No. 4.

In an examination of 182 men who had been previously inoculated the author draws the following very important conclusion, that in a patient inoculated over six months previously a reaction of 1 in 10 (that is 2½ times above the normal limits) indicates that the patient probably has typhoid fever, and therefore with a well attested strain, a diagnosis may be made even among the inoculated with a fair degree of certainty.

(The following tests carried out at Greenwich are fairly typical. Blood

tested daily for a week after first inoculation (B S) gave no agglutination from 1 in 20 upwards After the second inoculation of 1 000 million the agglutinins rapidly rose remained at a high level for a month and then fell markedly as shown in the following table —

MAXIMUM AGGLUTINATION VALUE OF SERUM AFTER SECOND INOCULATION

Day	2	6	10	14	24	30	38	45
Titre	1 in 100	1 in 600	1 in 800	1 in 1000	1 in 750	1 in 1000	1 in 200	1 in 100

After one year no agglutination of *B typhosus* in dilutions higher than 1 in 20 were observed) P W B S

WADE (E M) and McDANIEL (O) Observations on the Widal Reaction following the Administration of Typhoid Vaccine *Amer. Journ of Public Health* February 1915 No 2

An interesting report is given of the results of anti typhoid inoculations of 1 179 persons in an asylum every one of whom gave a negative Widal reaction before inoculation, three injections were given and the bloods were frequently examined afterwards At the time of the third dose 75 per cent were positive and ten days later 89 per cent Out of the 1 179 people, 770 who had previously given positive reactions when examined six months later gave 68 per cent negative Widals, 8 8 per cent partial reactions and 23 per cent positives, after one year out of 117 persons 11 7 only were positive P W B S

WILUCKI (V) Marine-Stabsarzt Paratyphoid Fever on Board S M S 'Posen *Archiv fur Schiffs und Tropen Hyg*, 1915, vol. xix, No 12

The author reports thirty three cases of paratyphoid B infection occurring on board S M S 'Posen The outbreak commenced ten days after leaving port *B paratyphosus* B was isolated from the water, this was afterwards rendered absolutely sterile by use of chloride of lime, as steam disinfection of the tanks had proved useless The infecting organism was also found in one sample of brawn used for food and 43 per cent of the cooks were proved to be ' carriers He states that passage of the organism through a dog increased its virulence The author believes that the water was the chief source of infection but he gives no definite proof Clinically the thirty three cases are divided into five groups of which the most interesting were those having symptoms resembling influenza There were no complications and no relapses. Eight of the cases proved to be carriers H L G

FLEXNER (SIMON) The Mode of Infection and Etiology of Epidemic Poliomyelitis *Amer Journ Dis Child*, Chicago, 1915 vol ix, pp 353 357

Two views have been put as to the means by which this disease is spread (1) That the stable fly conveys the infection This was suggested in the first place by the seasonal prevalence of the disease, namely at midsummer and in the early autumn, though a few cases

occur in the spring and even in the winter months in the second place by the rural character of some epidemics and by the relatively wide distances which separate many of the cases but here again, it must be admitted that epidemics of poliomyelitis occur in towns, and that cases may be closely grouped and lastly by some experimental results In 1912 Rosenau announced that he had succeeded in communicating experimental poliomyelitis to monkeys by allowing stable-flies to feed first on monkeys inoculated intra cerebrally with poliomyelitic virus and then on normal monkeys He believed that flies might carry the infection, and that some intervening period of time was necessary during which the virus underwent a developmental change in the insect host This was confirmed by Anderson and Frost but none of the numerous other observers have obtained positive results Anderson and Frost, indeed, failed to confirm their earlier results and no explanation of the successful experiments has so far been given

(2) The alternative view that the infection is conveyed by personal contact is accepted by Flexner In addition to the frankly paralytic and meningitic forms of poliomyelitis there are abortive and ambulatory cases which can be recognized by lymphocytosis of the cerebro spinal fluid by the presence in the blood serum of the immunity bodies found after a frank attack of the disease and absent from normal blood, and by the presence in the nasopharynx of the virus in such quantities as to give rise to poliomyelitis in inoculated monkeys There are also healthy "carriers who have been in close contact with acute cases of poliomyelitis and chronic "carriers who have recovered from an acute attack The possibility of the distribution of the virus by the frankly ill the abortive and ambulant cases, and "carriers" renders the personal communication probable Flexner also refers to his discovery two years ago with Noguchi of the filterable minute globular micro organism distinctly visible under high powers of the microscope which has been shown to be the virus of epidemic poliomyelitis H D R

FLEXNER (SIMON) and AMOSS (H L) The Rapid Production of Anti dysenteric Serum *Journ Exper Med*, N Y 1915 vol xxi, pp 515 524

As a result of the European War the Rockefeller Institute received requests for supplies of anti dysenteric serum which were in excess of the quantity available This rendered it advisable to discover a method of preparing the serum more rapidly, especially as it is doubtful if the serum is manufactured in bulk in any of the belligerent countries Hitherto the serum has been obtained by injecting horses subcutaneously with cultures or with the toxins of dysentery bacilli and it has taken a considerable time—nine to twelve months—to obtain an active anti serum Now by employing the method of successive intravenous inoculations of several varieties of dysentery bacilli, with intervening periods of rest, an effective polyvalent anti dysenteric serum suitable for therapeutic use in human beings can be prepared from the horse in about ten weeks Two distinct groups of bacilli, though indistinguishable morphologically and producing similar intestinal lesions, may cause acute dysentery They are readily differentiated by their power of fermenting certain carbohydrates and by their agglutinative reactions These two

groups are the Shiga bacilli which possesses limited fermentation powers and produces a soluble toxin and (*b*) the heterogeneous Flexner group of bacilli which possess wider fermentation powers than the Shiga bacilli and do not produce a soluble toxin. By injecting horses alternately with living dysentery bacilli belonging to the Shiga and Flexner groups a polyvalent serum of high power can now be obtained.

H. D. R.

NOGUCHI (HIDEYO). Pure Cultivation in vivo of Vaccine Virus free from Bacteria. *Journ. Exper. Med.*, N.Y. 1915, vol. xxi. pp. 539–570.

Up to the present time no method has been perfected by which vaccine virus can be propagated free from contaminating bacteria. The virus is propagated by transmission from the skin of one calf to that of another. Glycerine is employed as an elective germicide against the non spore bearing bacteria in fresh or "green" vaccine pulp, and after contact with concentrated glycerine in a refrigerator for one to three months the virus becomes "ripe" for vaccination on human beings and fairly free from bacteria. Such "ripe" vaccine however may contain streptococci, staphylococci, *Bacillus coli*, *B. subtilis*, and some other aerobic and anaerobic bacteria. Glycerine does not exert any action on bacterial spores and a sterile vaccine is never produced by glycerination. Noguchi has obtained pure cultures of vaccine virus by inoculation into the testes of rabbits and bulls of vaccine virus freed from associated bacteria by suitable disinfectants such as ether. The sterile vaccine is injected into the substance of the testis. The multiplication of the virus within the testis is at its maximum on the fourth or fifth day after inoculation and causes acute orchitis; the amount of vaccine remains stationary until the eighth day, and then diminishes until at the end of five weeks no virus is left. The virus can be indefinitely transferred from one animal to another, though several transfers from testis to testis are required to bring about accurate adaptation of the virus to the testicular parenchyma. As the transfers proceed the activity of the virus rises until, when adaptation is complete, the activity of the testicular strain equals that of the skin strain. As many as sixty transfers of a pure strain have been made in a year in rabbits. Human beings react to the pure testicular strain of vaccine in an absolutely typical manner. This method of cultivation and propagation of a bacteria free vaccine can be carried out with economy and without difficulty, and the strains thus obtained supply an ideal form of virus for human vaccination.

H. D. R.

News of the Service.

OFFICERS MENTIONED IN DESPATCHES

Extract from Despatch [illegible] Vice Admiral [illegible] de Robeck [illegible] landing of the Army on the Gallipoli Peninsula, April 25-26, 1915 —

Surgeon P. B. Kelly, R.N., attached to R.N.A.S., was wounded in the foot [illegible] of April 25 in River Clyde [illegible] during which time he attended 750 wounded men [illegible] walk during the last twenty-four hours.

[illegible] Temporary Surgeon W. [illegible] H.M.S. [illegible]

Extract from the London Gazette, August 16, 1915 —

[illegible] pleased to give orders for the following appointments [illegible] Distinguished Service Order and for the award of the [illegible] Officers in recognition of their services [illegible] patch —

[illegible] Distinguished Service Order: Surgeon [illegible] R.N.

The following awards have been made in recognition of services during the [illegible] the Dardanelles prior to April 25 [illegible]

[illegible] pleased to give orders for the following appointments [illegible] Service Order:

Surgeon [illegible] R.N. During the time H.M.S. [illegible] great [illegible] danger of sinking on passage [illegible] continued his work.

The following Officers [illegible] in action:

Fleet-Surgeon Edward [illegible] R.N.

Surgeon John Harding [illegible] R.N.

Extract from General Sir Ian Hamilton's despatch dated June 12, 1915

List of the names of those Officers [illegible] and recommended to Their Lordships' notice —

Surgeon [illegible] R.N. [illegible] Battalion.

September 13, 1915 — [illegible] pleased [illegible] the following officers the Distinguished Service Cross [illegible] the services mentioned —

Surgeon Basil Alfred Playne, R.N., Royal Naval Division.

For gallantry and good service during operations [illegible] April [illegible] he [illegible] regardless of the [illegible] conspicuous bravery [illegible] great confidence and spirit [illegible]

APPOINTMENTS

June

Surgeon [illegible] James Porter, K.C.B., K.H.P. [illegible] to the Medical [illegible] C. B. Maclean, M.D., B.A., to be lent [illegible] Hospital [illegible] Land Transport during [illegible] Sir James Porter with [illegible] Chatham.

Fleet Surgeon J. H. [illegible] to the Minotaur. W. H. S. Stalkartt to R.N. [illegible] Devonport. H. J. Haldane, R.N. (Retired), to R.N. Air Station, Hendon.

[illegible]

OBITUARY

[illegible]

ADMIRALTY ORDERS ISSUED FROM AUGUST 1, 1914, TO AUGUST 1, 1915[1]

(The more important Orders pertaining directly to the duties of Medical Officers which are not confidential are included only.)

GENERAL

146 (W.O. [illegible]).—Patients suffering from Mental Disease
(N./M.D. [illegible].—1.10.1914.)

In order to facilitate the early relief of the Naval Hospitals from patients suffering from mental disease, the Service Certificates are to accompany all patients sent to hospital suffering from mental disease or mental weakness.

195 (W.O. [illegible] and 505). Ratings discharged to Hospitals or Hospital Ships
(N.—2.11.1914.)

When ratings are discharged to Hospitals or Hospital Ships from H.M. Ships application is to be made to the Admiralty, as laid down in M.O. 172/1914, for the vacancy so caused to be filled as soon as possible. The Depot to which the man discharged belongs is at the same time to be stated.

(2) When the ratings in Hospitals are discharged cured they are to be sent to their Depots and not to the Ships.

(3) The papers of such ratings are to be transferred direct from their Ships to their Depots.

M.O. 172/1914.

35 (W.O. 561/1914).—Patients discharged from Ships for Treatment
(N./M.D. 16015/14.—1.1.1915.)

The attention of Medical Officers is drawn to the necessity of sending a report on Form M. 188 on all patients who are discharged from ships, whether to other Ships, Naval or Military Hospitals, or to Civil Establishments.

238.—Information to accompany Blood sent for Wassermann Test
(M.D. 1626/15.—1.5.1915.)

When blood is sent to Hospitals to be tested as to the Wassermann reaction Medical Officers are to forward also the following particulars:—

(1) Name of patient.

(2) Whether blood is sent for diagnosis only.

(3) Amount of treatment received by the patient.

(4) Whether patient is under mercurial treatment now. If not, the date when mercury was discontinued.

(5) Dates and results of any former blood tests.

265 (W.O. [illegible]).—Naval Patients under Treatment in Civil Hospitals for Scarlet Fever
(N.—1.6.1915.)

When a case of Scarlet Fever is discharged to a Civil Hospital the authorities of the Hospital should be asked not to discharge the man for at least six weeks. Should retention for this period be impossible the patient must be sent for the completion of [illegible] six weeks quarantine to the nearest Naval Infectious Hospital.

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[1] A notice re cost of reprints or excerpts will be found on p. [illegible]. They can be obtained on application to our Publishers.—Ed.

344 (B. [illegible]).—Dental Treatment of Naval Officers and Men.
(C. E. 19666.—1.7.1915.)

In [illegible] cases where it is [illegible] possible to obtain the services of a Dental Surgeon [illegible] Naval [illegible] [illegible] be allowed reasonable expenses incurred [illegible] [illegible] of [illegible] extractions or temporary stoppings, and the privilege [illegible] the case of naval ratings may be extended to cover [illegible] as well as of the cost of extractions provided [illegible] that discharge [illegible] would be impossible or unnecessary [illegible].

It is arrangement [illegible] for the period of the war only.

358 (B. [illegible]).—Cases of Cerebro-spinal Meningitis—Procedure.
(M. [illegible] 15.—1.7.1915.)

Should a case of cerebro-spinal meningitis occur in any ship the patient is at once [illegible] discharged to Hospital or Hospital Ship. In addition, all close contacts [illegible] sleeping or [illegible] the man sitting next to him [illegible] special [illegible] also be discharged to Hospital and examined [illegible].

Apart from [illegible] men [illegible] should be kept under daily examination [illegible] by a Medical Officer [illegible] at least once a day for a period of [illegible].

The usual precautions [illegible] should be carefully carried out.

120 (B. [illegible]).—Wounded Officers—Particulars.
([illegible] W. [illegible] 10.1914.)

Medical Officers attending wounded officers should report at once to the Medical [illegible] Admiral [illegible]:—

(1) The [illegible]
(2) The [illegible] wound [illegible] the wound.
(3) The disposal—giving name of Hospital Ship or Hospital to which sent [illegible] as the case may be.

139 (W. O. [illegible]).—Wounded Men Distinguishing Marks for.
(S.—1.10.1914.)

Medical Officers on first attending to the wounded should put a distinguishing mark on the clothes or cot of the wounded man to show the degree of wound [illegible]. A luggage label (cloth) or a piece of cloth with the undermentioned [illegible] [illegible] pencil should be used:—

Label without any mark	Slightly wounded
Label with blue pencil cross	Severely wounded
Label with red pencil cross	Dangerously wounded

These labels should be tied on in a conspicuous place so that [illegible] the degree of wound may be evident without any examination or disturbance of the [illegible].

192 (W. O. [illegible]).—Casualties during Hostilities—Reporting.
(N. P. 1948/14.—2.11.1914.)

Care is to be taken that all casualties (including dead, wounded and missing) [illegible] reported by telegraph to the Admiralty at the earliest possible moment. In the case of Destroyer Flotillas, Captains (D.) are to make arrangements [illegible] as practicable the lists should be telegraphed to the Admiralty from the Depot Ship of the Flotilla after verification of ratings, official numbers, &c.

The Admiralty will communicate with the relatives in all cases, and the [illegible] to relatives by the Captain of the ship is not to be made, but [illegible] procedure laid down in Article 572 of the King's Regulations (Volume [illegible]) is to be followed. (In Naval Hospitals and Sick Quarters the ordinary [illegible] be followed [illegible].)

193 (B. [illegible]).—Men Wounded in Action—Hurt Certificates.
(N. P.—2.11.1914.)

Men wounded in action are to be granted Hurt Certificates, as in the case of men [illegible] injured in the execution of their duty, these documents forming the only [illegible] that the injuries are attributable to the Service.

The [illegible] 1318 and 1354 of [illegible] practicable, although [illegible] it is ascertained [illegible] possible.

236 ([illegible]) —Water Tanks—Cleaning of

(N.L.D. [illegible] 1.5.1915.)

[illegible] present rules [illegible]:—

(i) [illegible] work of [illegible] in all Ships is to be carried [illegible]

(ii) [illegible] footwear of the men who [illegible] to be [illegible]

(iii) [illegible] work is to be done by the Ship, not by Contractors.

237 ([illegible]) — Improvised Accommodation

(M.L.D. 1424/3777/15.—1.5.1915.)

[illegible] it becomes necessary to improvise accommodation for officers [illegible] of such accommodation should be inspected and reported on by [illegible]

VENTILATION

146.—Warm Air Supply to Living Spaces in H.M. Ships

(D. 1189/14.—11.1.1911.)

[illegible] having been received from the 1st and [illegible] Battle Squadrons [illegible] Squadron and the 1st Light Cruiser Squadron in reply to [illegible] the supply of warm air to the living spaces in certain of H.M. Ships [illegible] drawn up for guidance in the management of [illegible] months in cold [illegible]:—

[illegible] of between 55° and 60° should if possible be maintained [illegible] during the [illegible]

[illegible] when the heaters are turned on a temperature of 50° is sufficient [illegible] not often be required.

[illegible] understood [illegible] of the heaters [illegible] deck [illegible] the delivery openings [illegible] should [illegible]

[illegible] temperature of the artificially supplied air should be regulated:—

[illegible] more than [illegible] steam [illegible] number of [illegible] the steam and [illegible] position of the [illegible] controlling the [illegible] that the speed of the fan controls [illegible] will not be altered in an attempt to [illegible] the temperature [illegible] the temperature of the [illegible] should be made [illegible] [illegible]

222.—Ventilation—Analysis of Air

(M.D. 7015/11.—2.11.1911.)

[illegible] from the [illegible]

91 (*W O 103*) —Ventilation Party

(D 99190/15 —1 2 1916)

Attention is called to the necessity of maintaining a properly organised ventilation party on board H M Ships under careful supervision and with regular routine for working and examining valves and keeping the system efficient particularly as regards its watertightness

972 —Windscoop designed by Engineer-Commander F J Roskruge R N

(D 6131/15 —18 6 1915.)

The following description and sketch showing a proposed arrangement of "light" baffles to enable the windscoops at present fitted to side scuttles during daylight to be used for ventilating purposes after the ship has been "darkened" at night is promulgated for general information —

Three Light Baffles A B C are fitted as shown in Sketch and I connected together as drawn may be bodily removed from the present Windscoops during daylight or Baffle B may be permanently secured to the Windscoop and the other two Baffles withdrawn or complete Windscoops of this design may be constructed for use at night only

(*East Indies 6 4 15, No 137/415*)

LIGHT PROOF BAFFLES FOR SCUTTLE WIND SCOOPS

1063 —Ventilation Arrangements

(D /N D 5237/15 and D 10402 15 —27 1915)

In order that the means provided for ventilation may be used to the best advantage the Commanding Officers of H M ships (except "Queen Elizabeth") are to report on Form S 176 the scheme adopted in each case for running the fans This report is to include a statement as to which fans are in use at different periods of the day and night and for how long

The broad outlines of such a scheme should be that as far as possible the fans supplying all the living spaces and certain special fans such as those ventilating Heads and W C s are run for about twenty hours out of twenty four and the remainder as requisite

Those fans and natural exhaust and supply trunks which are to be utilised in action are also to be specified

"*Queen Elizabeth*" *Class*

(1) A modified French water excluding top is to be fitted to the ventilation intakes and exhausts of the 6 inch Transmitting Stations

[illegible] the place [illegible]
[illegible]
[illegible] The letters [illegible]
[illegible]
[illegible] the S[illegible]
([illegible] 1915 Form S 176)

1188 Ventilation Systems of H M Ships—Alterations to
(D 11531 [illegible]—23 [illegible] 1915)

[illegible] ventilation systems of H M ships are to carried out [illegible] approval

STORES

338 Operation Gowns.
(M D 1116/14—9 9 1914)

[illegible] operation gowns to all ships carrying Medical Officers [illegible] as follows —

[illegible] Battle Cruisers and Cruisers [illegible]
[illegible] other ship bearing a Medical Officer [illegible]
[illegible] available at the R N Hospitals for issue to H M [illegible]

482.—Hypodermic Solution of Morphia
(M D 2[illegible]/15—26 3 1915)

[illegible] hypodermic solution of morphia has been added to the [illegible] the Service [illegible] Medical Officers are to [illegible] in accordance with the following scale —

Ships carrying a Medical Officer with a complement of 600 and over	8 oz
Ships carrying a Medical Officer with a complement under 600	4 oz

739.—Medical Stores allowed to Destroyers.
(M D 5101/15—7 5 1915)

[illegible] inch bandages allowed to Destroyers has been increased from [illegible] Medical Officers of Parent Ships are to draw the extra allowance from [illegible] at their [illegible] port and distribute them to the Destroyers [illegible] charge

800.—X ray Coils—Preservation
(M D 5769/15—1 6 1915)

[illegible] to prevent wastage of platinum and destruction of [illegible] of voltage 12—20 when showing signs of [illegible] sparking on platinum points should be sent as soon as possible [illegible] The coil alone should be sent

862 (R O 860)—Boracic Powder
(M D 5709/15 1 6 1915)

[illegible] equal parts of salicylic acid and boracic acid has [illegible] allowed to the Service [illegible] for use in the [illegible] This powder will be put up in dredger tins [illegible] will be known as Boracic Powder [illegible] as follows —

[illegible] No 1 Medicine Chest	[illegible] tins
[illegible] No 2 Medicine Chest	2 tins
[illegible] No [illegible] Medicine Chest Destroyer Medicine Chest, [illegible] Medicine Chest and Submarine Medicine [illegible]	1 tin

[illegible] to demand quantities to complete to Scale from their [illegible] for and issue to their Tenders

PERSONNEL

15 ([illegible] 1915).—Surgeon Probationers, R.N.V.R.—Leave to attend Examinations

(C.W. [illegible] 1.1.1915.)

Surgeon Probationers, R.N.V.R. are to be granted reasonable leave to attend their professional examinations [illegible] the Admiralty being informed in each case [illegible] such [illegible] granted.

51.—Sick Berth Ratings—Recommendation for Warrant Rank

(C.W.—1.8.1914.)

Recommendations of Chief Sick Berth Stewards for Warrant rank are to be made [illegible] by the Medical Officer of the ship and forwarded through the Commanding Officer.

153 (W.O. 394).—Reserve of Medical Officers. Equipment Allowance

(C.W. [illegible]—1.1.1915.)

Officers belonging to the Reserve of Medical Officers [illegible] Order in Council [illegible] August 11, 1903, are to be paid an equipment allowance of £20 on being called out for service.

159 (W.O. 314). Surgeons, R.N.V.R.—Promotion to Staff Surgeon

(C.W.—1.4.1915.)

Surgeons, R.N.V.R. will be considered qualified for promotion to the rank of Staff Surgeon, R.N.V.R. on completing six months' active service, provided they have [illegible] eight years' seniority in lieu of the courses which they are required to undergo in time of peace.

160 (W.O. 3[illegible]).—Surgeon Probationers, R.N.V.R.—Examination Leave

(C.W.—1.4.1915.)

Leave for Surgeon Probationers to attend examinations [illegible] limited [illegible] longer period is required [illegible] will be necessary. No [illegible] during leave.

(W.O. [illegible] 1916.)

172 (W.O. [illegible]).—R.N. Auxiliary S.B. Reserve—Promotion to Senior Reserve Attendant

(N. [illegible]—1.1.1915.)

All Junior Reserve Attendants on Active Service at the date of this Order are to be considered eligible for promotion to the rating of Senior Reserve Attendant provided they are in possession of the Advanced First Aid and Nursing Certificate or hold the Medallion of the St. John Ambulance Association and the Nursing Certificate of that body.

In addition they must be reported upon as efficient by the Medical Officer under whom they are serving.

The names of the Junior ratings recommended for promotion are to be forwarded to the Medical Director General for approval prior to advancement by their Commanding Officers.

322 (W.O. [illegible]).—Sick Berth Staff—Examination and Promotion

(N. 21041/15.—1.7.1915.)

In the case of members of the Sick Berth Staff afloat who are [illegible] of sitting for the examination for a higher rating, one of the following alternative methods should be adopted:—

(1) To hold a special examination when the ship returns to a home port, should any rating be qualified [illegible] for examination. Notice should be given to the hospital by the Medical Officer of the ship so that the examination may be held immediately after the arrival of the ship.

(2) To grant men [illegible] leave from seagoing ships to enable them to attend for final examination at one of the recognised examination centres. Notice should be given to the hospital by the Medical Officer of the ship so that a special examination may be arranged.

The [illegible] Article 387 of the [illegible] ment [illegible] three years [illegible]
It has [illegible] been issued to [illegible] S. B. Staff [illegible] passed [illegible] promotion [illegible] professionally.

452.—Sick Berth Staff—Final Examination for Higher Ratings.
(M.D. 8290/15.—4.3.1915.)

In the case of members of the Sick Berth Staff afloat who are desirous of [illegible] final examination for a higher rating, one of the following alternative methods should be adopted:—

(1) To hold a special examination when any ship comes into a home port, should any rating be qualified for and wish to sit for examination. Notice should be given to the hospital by the Medical Officer of the ship so that the examination may be held immediately after the arrival of the ship.

To relieve men who are qualified and may wish to sit for examination when [illegible] as possible.

The Medical Officer of any ship having candidates on board should acquaint the Drafting Officer of the man's depot that this is the case, and steps will then be taken for such men to be exchanged as soon as possible.

1268.—Surgeons.—Promotion to Rank of Staff Surgeon.
(C.W. 30/7/15.)

During the present hostilities Surgeons who have served the necessary period for [illegible] and who have not had the opportunity of attending a promotion course at [illegible] may, provided they are recommended for advancement by the Director-General of the Medical Department, be given the acting rank of Staff Surgeon. They will not be confirmed in rank until they have passed the usual examination, and in the event of an Acting Staff Surgeon failing to pass the examination when an opportunity occurs he will at once revert to the rank of Surgeon.

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